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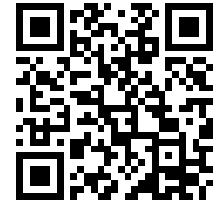

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THE

RAILWAY MAGAZINE.

VOL. XLIX.

JULY TO DECEMBER,

1921.

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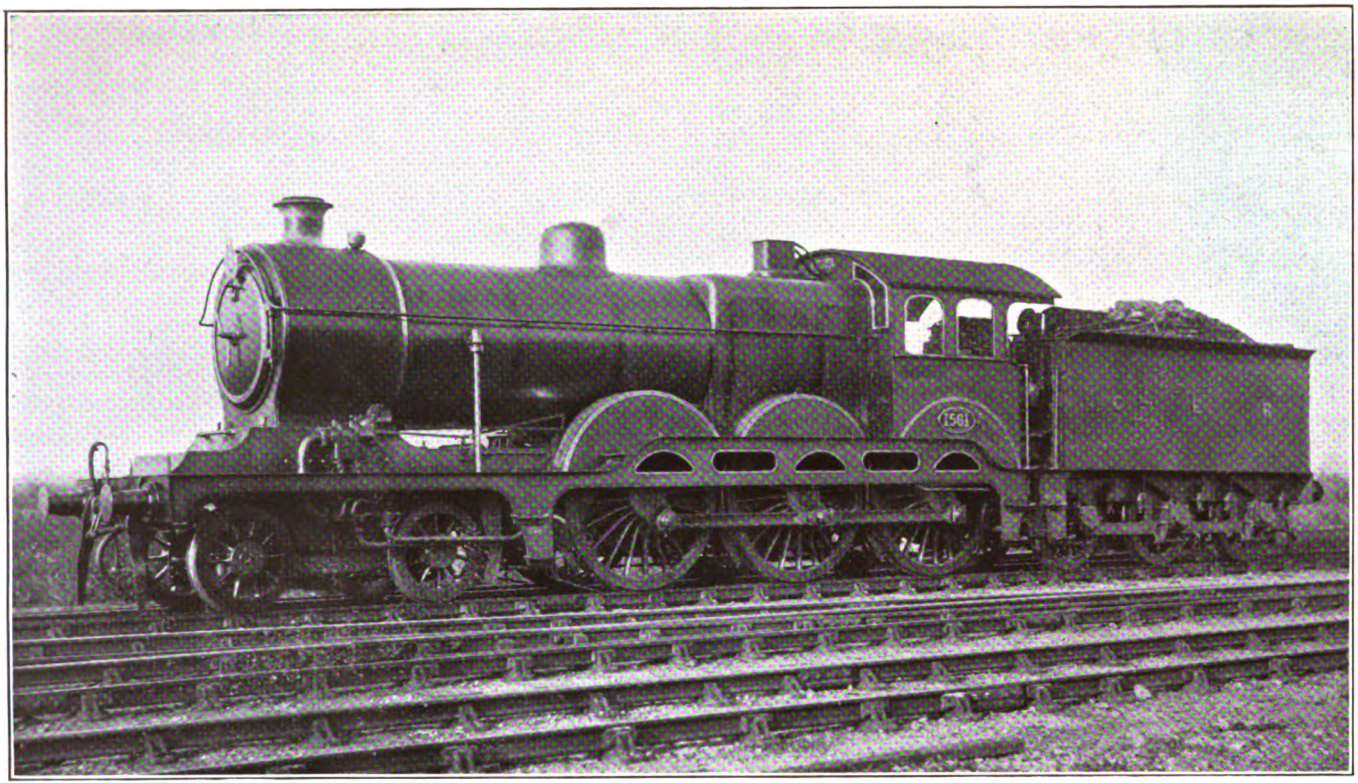

THE RAILWAY MAGAZINE.

NEW · 4-6-0 SUPERHEATER LOCOMOTIVE No. 1561, GREAT EASTERN RAILWAY.

Designed by Mr. A. J. HILL, C.B.E., Chief Mechanical Engineer, and Built at Stratford, 1920.
Cylinders, 20in. by 28in. Coupled Wheels, 6ft. 6in. diam. Bogie Wheels, 3ft. 3in. dia.
Heating Surface—Small Tubes, 1,123 sq. ft.; Large Tubes, 366 sq. ft.; Firebox, 143 sq. ft.; Superheater, 286 sq. ft.; Total, 1,918 sq. ft.
Grate Area, 26·5 sq. ft. Steam Pressure, 180 lbs. per sq. in. Weight in working order, 63 tons.
Tender Capacity—Coal, 4 tons; Water, 3,700 galls. Weight of Engine and Tender in working order, 101¼ tons.
Fitted with Exhaust Steam Injector, Wakefield Mechanical Lubricator, etc.

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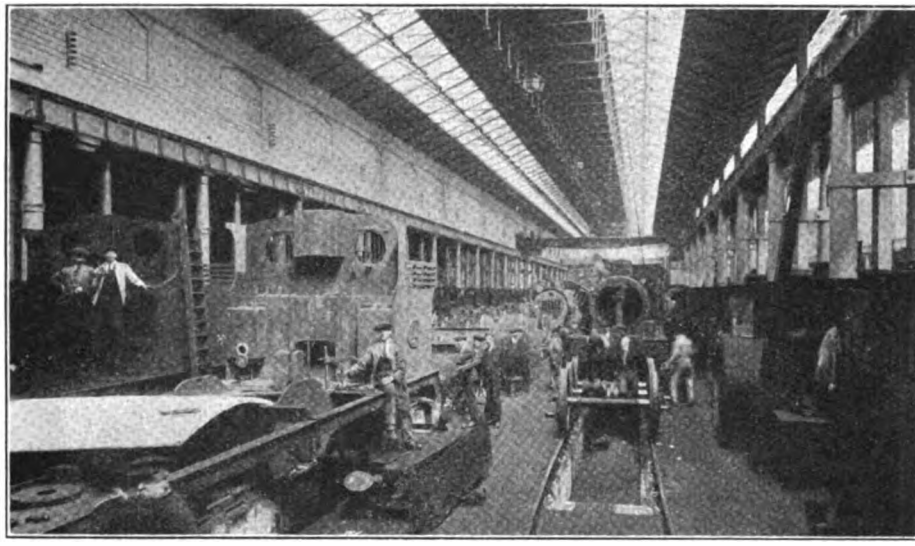

A VIEW IN THE LOCOMOTIVE ERECTING SHOP.

Stratford Works, Great Eastern Railway.

By J. F. GAIRNS, M.I.Loco.E.

A FEW yards to the north of No. 5 platform (used by up Loughton branch and Cambridge line trains) at Stratford Junction station is an old building, now in course of enlargement, accommodating the headquarters and works staff of the Chief Mechanical Engineer's Department of the Great Eastern Railway Company. On the roof, now a storey higher than formerly, has been replaced the old weather vane, in the form of an early Eastern Counties Railway locomotive, denoting that these were the original offices erected when the locomotive works were transferred from Romford factory (now the hay and fodder stores of the company) to Stratford in 1847. Adjacent is another relic of those days, the polygonal running shed (the name of which is perpetuated by the "Polygon" signal cabin immediately in front of the general offices), though it has long since been diverted from running to works purposes. Behind the offices are several ranges of workshops, some nearly in their original condition, but most of them extended or given an additional storey.

Here, in the triangular area between the Colchester and Cambridge main lines (this was long before the days of the Hackney Downs route now used by most Cambridge line passenger trains), on a space of some 15 acres, from 1847 and for over 20 years afterwards, the entire locomotive and rolling-stock manufacturing and principal repairing needs of the company were met, while accommodation was also provided for locomotives in service. The general office building was only partially used as such, as it also accommodated the stores department, and it lacked the drawing office extension added in later years. Through the central archway engines could be run direct in or out by a track crossing the Cambridge line. Otherwise, most of the original buildings can still be identified, though they may have changed their purpose. In a north-westerly direction

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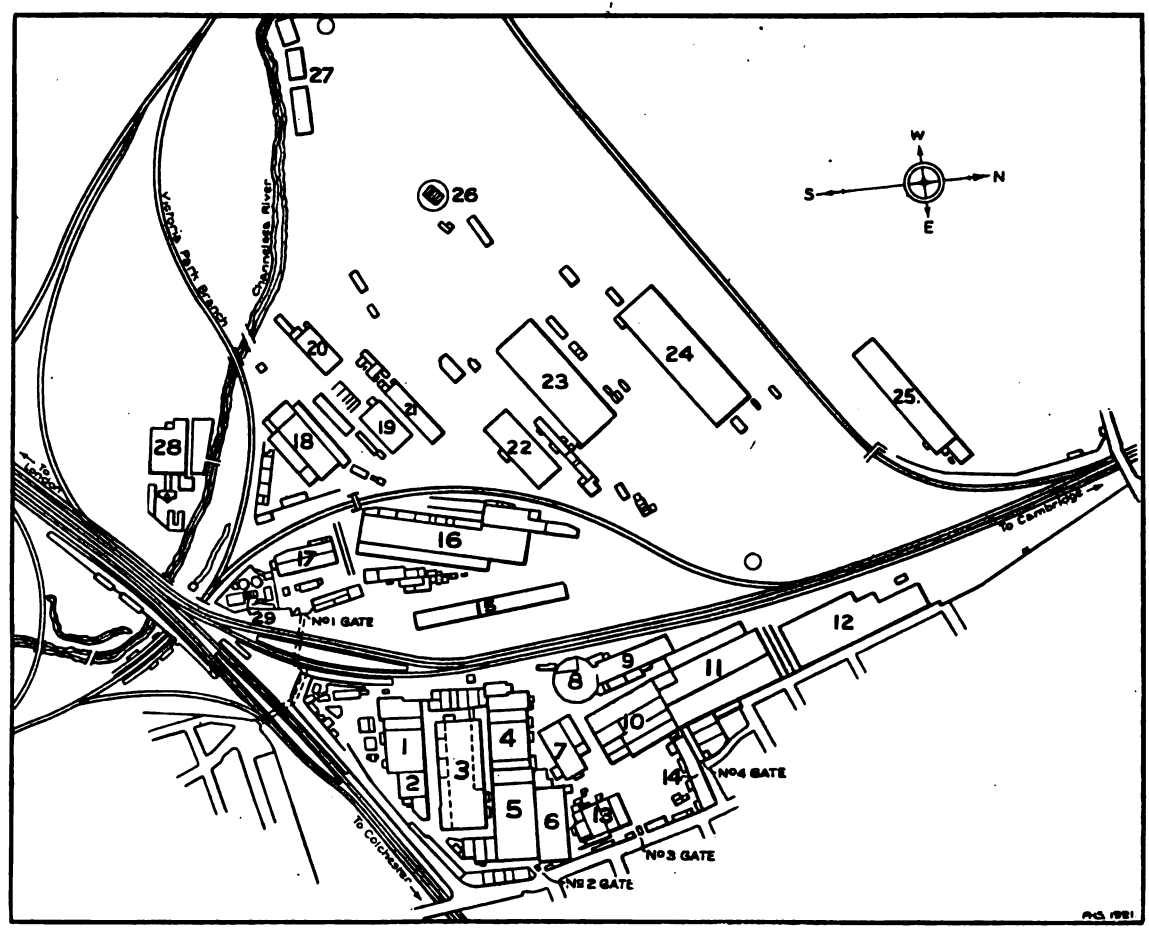
1. Loco. machine shop.
2. Loco. machine shop extension
3. Erecting shop.
4. Loco. smithy.
5. Boiler shop.
6. Boiler mounting shop.
7. Loco. wheel shop.
8. Wheel fitting shop.
9. Carriage paint shop.
10. Carriage saw mills, &c.
11. Body shop.
12. Carriage repair and ifting shop.
13. Road van shop.
14. Carriage dept. smithy.
15. Carriage shed.
16. Carriage dept. extension shop.
17. Carriage wheel and stamping shop.
18. Iron foundry.
19. Loco. paint shop.
20. Boiler repair and tube shop.
21. Tender shop.
22, 23. Running sheds.
24. New engine repair shop.
25. New carriage paint shop.
26. Oil fuel storage.
27. Timber stores.
28. Power station.
29. Gas works.



PLAN OF STRATFORD WORKS, GREAT EASTERN RAILWAY.

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the wagon and carriage shops extended a short distance beyond the original running shed.

But little room was available for enlarging the works from their original area, so that in the course of years it has been necessary to erect various new shops on reclaimed marsh land to the west of the Cambridge lines. But concurrently with these developments the traffic department was extending carriage and other sidings, and building new connecting and goods lines, so that the works buildings are now involved in a maze of railway tracks aggregating many hundreds of miles within a radius of a mile of the general offices. Still more recently several big and modern works premises have been added, and those on the outskirts are designed so that they can be further enlarged when need arises.

The result is a somewhat scattered lay-out, complicated by running and goods lines and carriage and other sidings in bewildering array. But as far as the respective allocations can be disentangled, 24½ acres are now devoted to locomotive building and repairing, 40 acres to carriage and road van building, &c., and about 44 acres are utilised by the Operating Department (now separated from the Chief Mechanical Engineer's Department) for locomotive running purposes. It will be noted that no provision is made for railway wagon construction and repair. This is now centralised at Temple Mills, about three-quarters of a mile down the line towards Lea Bridge, where new works, covering an area of 24 acres, were brought into use in 1896 for wagon building and repairing. Here also are constructed steel underframes for railway carriages, but as these works are themselves of sufficient extent and interest to justify an article on their own account, further reference will be given in the next number of the RAILWAY MAGAZINE.

Stratford works are served by five entrances for workpeople, three adjacent to that part of the Borough of West Ham referred to as Stratford New Town, or by old inhabitants as "Hudson's Town," as it developed in consequence of the building of the works at a time when "King" Hudson included the Eastern Counties as one of the railway companies over which he reigned in the exciting days of the "forties."

No. 1 is principally used by men going to shops west of the running lines. It is placed at the end of the tunnel under the passenger station, and serves also for running shed and other employees. No. 2 is the chief entrance for the old works, and is known as the "Loco. Gate." No. 3 serves for the road van and carriage shops in the old area, while No. 4, which is close by, is reserved for women employees, engaged in the polishing and upholstery sections of the carriage shops. A further entrance for the use of men employed in some of the more distant buildings is provided adjacent to the bridge which carries Temple Mills Lane over the line, at the northern end of the old works area. Altogether about 5,400 men and boys and nearly 100 women are normally attached to the Chief Mechanical Engineer's Department. Here and there, however, are buildings belonging to the stores and other departments, so that, in conjunction with the running and traffic departments, a total of some 8,000 men are employed at Stratford.

The general office building is now in course of enlargement, but the following notes are based upon its contemplated allocation on completion. On the left of the archway, approaching from the front facing the running lines, is a ground-floor range of offices, including the private rooms of Mr. A. J. Hill, C.B.E., Chief Mechanical Engineer, Mr. A. W. Headley, Chief Clerk, Mr. C. W. L. Glaze, O.B.E., Works Manager (and Chief Assistant to the Mechanical Engineer) and Mr. T. O. Mein, Assistant Works Manager, with their respective office staffs. Beyond, in an extension building, is the locomotive and rolling-stock drawing office, of which Mr. E. S. Tiddeman is chief. To the right of the archway are the stores offices and old material stores. On the first floor are the offices of Mr. F. Duce, Outdoor Assistant to Mr. Hill, and his staff, a new staff dining room, and the private offices of Mr. A. Thorp, Stores Superintendent. The second floor accommodates the Locomotive Accountant's offices, of which Mr. D. Sayer is chief, these being in several sections according to the subdivisions of the work. The new top floor accommodates the works telephone exchange.

Behind the general offices is the erecting shop, flanked on one side by the machine

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Photo.] *[Elliott & Fry.*

MR. A. J. HILL, C.B.E.,

Chief Mechanical Engineer,
Great Eastern Railway.

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shop block, and on the other by the smithy and boiler shop building, both incorporating original premises, and including various sub-shops. Dealing first with the machine shop block, that portion nearest the running lines comprises the general stores, and adjoining this is the tool shop. In the latter are made all tools—milling cutters, drills, jigs, gauges and templates—required for various purposes. The tool smithy is fitted with smiths' hearths, a power saw, oil and water tempering baths, a "salt" bath, and a 5 cwt. B. & S. Massey electro-pneumatic hammer, with foot control. In the tool shop are triple lathes on which blanks are roughed out, three at a time, by lads, and then passed on to skilled tool-hands engaged on the various special machines, including milling machines, lathes, drills, &c., with a complete equipment of tool and twist drill grinders of various types, with fitters' benches for detail work. In the corner are the tool shop stores and machine shop tool stores. The former receives stock from the tool shop, while the latter deals with issue of completed tools. jigs, gauges, &c., to the adjoining machine shops. For each workman a set of numbered checks is provided, and as tools, &c., are issued a check is hung upon a hook adjacent to the locker from which material has been withdrawn. Above the tool store is the general premium office, the Rowan system being adopted throughout the Stratford Works.

The original machine shop consists of three bays. In that adjacent to the tool shop is a double range of semi-automatic machines of various types for making bolts and screws. Next, is a row of heavy general duty lathes devoted to the turning of piston rods, bushes, piston rings, &c., and beyond a trolley track is a row of big lathes used for other heavy work. The middle bay is fitted with miscellaneous machines, in groups or rows, including lathes of various types, vertical boring machines, drills, slotting and planing machines. Among them is a row of light lathes for bolt and like work, with which nearly everyone who has served his time at Stratford has made acquaintance as a youth. The end bay contains slotting, planing and milling machines, including many of large size. Special machines in this section include a Fellows gear shaper, fitted in the works with a vernier scale enabling extreme exactitude to be obtained, and a Gleeson gear cutter for bevel wheels. Along the outer walls are benches for incidental work, including a section where youths "centre" the blanks ready for the lathes. Jib cranes are provided here and there to facilitate the handling of work in the case of the heavier machines.

Beyond is the machine shop extension, adding two bays. Cylinders and coupling rods are mainly dealt with here, and the machines are placed in process order so that the work can be readily transferred from machine to machine. At the end of the first bay is the foreman's office, and adjacent are the marking-off tables. Machines in this section include heavy planing, milling and boring machines, with drills in the centre, among which may be mentioned a slot-drilling machine, single and multiple head-boring machines and planing, drilling and slotting machines. The cylinder section is equipped with a 5-ton overhead travelling crane with floor control. The other bay has a 3-ton crane of similar type. Among the special operations carried on here are the machining of cylinders (a big four-head cylinder boring machine may be mentioned), details for built-up crank shafts, side rods (including one boring machine which operates upon both ends simultaneously) also machines for fluting, and turning and trimming the ends. Radial axle boxes are also in evidence. A 5-ton jib crane outside the end bay enables cylinder and other heavy castings to be easily transferred from railway wagons alongside to a marking off table adjacent, and thence by the 5-ton overhead crane to the machines in series. A portable bench fitted with a light crane facilitates the fitting of cylinder covers, &c. The machine shop is 223 ft. long and 132 ft. wide in the main bays.

These shops, as also most of the works buildings at Stratford, are steam heated, adding greatly to their comfort in cold weather. Electric drive is universal, by belting for the smaller and medium machines in groups, with individual motors for those of heavy types. Nearly all shops have roof lighting in addition to side lighting.

The machine shop block is completed by a somewhat narrower portion beyond

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Photo.] [*Wormald.*

MR. C. W. L. GLAZE, O.B.E.

Works Manager.

Photo.] [*Elliott & Fry*

MR. E. S. TIDDEMAN,

Chief Draughtsman.

Photo.] [*Kate Fisher and Sybil Vine.*

MR. A. W. HEADLEY,

Chief Clerk.

Photo.] [*F. G. Paget.*

MR. D. SAYER,

Locomotive Accountant

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the extension, devoted to coppersmiths' work. Here there is a powerful hydraulic pipe-bending machine, a set of rolls, two pneumatic belt-driven hammers, and usual machines and appliances. Parallel with the machine shop building is the main erecting shop, immediately behind the general offices. This is the original building and is 350 ft. long and 142 ft. wide. It has four main bays; the two centre ones will together accommodate 50 engines, and are each served by two 30-ton overhead electric cranes, with two 3-ton hand travelling cranes for conveying parts. The two side bays are used for fitting, and a few heavy machines, the portion dealing with engine frames and heavy castings being provided with a 15-ton overhead electric crane. The centre bays are lofty and well lighted from above. Upper floors were erected in 1887 over the two side bays in order to accommodate the brass finishing and brake shops, works drawing office and chemical laboratory.

Below the brass finishing shop part of the side bay is devoted to general millwrights' work, with suitable machinery. In an enclosure are two sets of Wilson electric welding plant, principally used for strengthening weak, and making good worn places in parts treated. Sets of fitters' benches serving the engine pits adjacent may be noted. The remaining space may be regarded as an overflow from the main machine shop in the neighbouring building, accommodating a heavy planer for steel axle boxes, &c., piston and valve rod grinding machines, various miscellaneous appliances and the fitting shop tool stores.

In the erecting shop proper the south bay is usually reserved for repairs, new construction being dealt with in the north bay. Portable cylinder boring and other appliances are provided as usual. The end portion of the north side bay is used as the frame shop, and is equipped for frame straightening, and provided with slotting (a big three-head machine), radial drilling and other suitable machines. This part is served by a 15-ton overhead electric crane. Among miscellaneous equipment may be noted an air compressor and gauge and safety valve testing benches.

On the upper floor, on the side adjacent to the machine shop and nearest to the general offices, is the works drawing office. Next is the chemical laboratory, where tests of a chemical nature as required by the works and stores, also by the Commercial and other Departments in regard to chemical questions involved by goods traffic, claims, &c., are carried out. Physico-chemical investigations are also undertaken, while a special feature is made of microscopical examination of metals and alloys and micro-photography. Adjoining is the strap shop, for belting, and the remainder of the upper floor on this side forms the brass-finishing shop. Here are various machines, lathes, &c. (largely of semi-automatic or automatic types), suited to the department, together with a group of copper-stay machines, fitters' benches, &c. At the end is a small brass castings store, and a 1-ton hydraulic lift to the floor below. The corresponding upper storey on the other side does not extend the full length of the outside bay of the erecting shop, and is devoted entirely to the machining, assembly, repair and testing of Westinghouse brake equipment; also of vacuum apparatus as far as it is fitted to Great Eastern Railway engines and rolling-stock.

The third of the main group of buildings includes first, adjacent to the main drawing office, the test shop, which has a 50-ton Buckton testing machine, fitted with Wicksteed's automatic apparatus for taking stress-strain diagrams, a 75-ton chain testing machine adapted for a length of 80 ft., with a pit whereby each link can be examined, a rubber testing machine, and tools for preparing specimens. Alongside is the spring shop, 132 ft. by 40 ft., with a small enclosure outside where buckles are forced off. The plant here includes spring testing machines, tools for nibbing and slotting, punches, hammers, nut and bolt screwing machines, furnaces and water and oil baths for hardening and tempering. In the smithy, 136 ft. by 132 ft., are rivet making, heavy nut forging, "Ajax" forging and other machines, some served by Ferguson liquid fuel furnaces. There are 50 smiths' hearths, 9 steam hammers (served by two locomotive boilers outside), nut and bolt machines, together with an electric butt-welding machine for longitudinal boiler stays, and a small tool smithy in the corner.

Separated from the smithy by an iron

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1. NEW ENGINE REPAIR SHOP.
2. NEW ENGINE REPAIR SHOP.
3. LOCOMOTIVE MACHINE SHOP.
4. LOCOMOTIVE MACHINE SHOP EXTENSION.

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store is the forge or "steam-hammer" shop, 140 ft. by 71 ft. The hammers, one 5-ton, one 3-ton, one 30-cwt. and one 15-cwt., are served by four locomotive boilers fired by waste gases from coal-fired furnaces over which they are placed. The two independently-fired furnaces outside the smithy are connected with the boilers in the forge, and the various hammers can be served from any or all of them through a system of steam holders. There are also two regenerative furnaces supplied from a Wilson gas producer outside. Other equipment includes heavy punches and shears, a hot saw, and a machine for bending draw-hooks, &c. Adjoining is a tyre-shrinking well for locomotive wheels, served by a 5-ton overhead electric crane, with tyre furnaces, and case-hardening furnaces (served by the Wilson gas producers already mentioned).

The remainder of this building contains the boiler shop, 212 ft. long by 139 ft., in six bays, with the boiler mounting shop (230 ft. by 100 ft.), and light plate shop (74 ft. by 46 ft.) adjoining. At one end of the boiler mounting shop is the flanging shop, provided with 240 and 300-ton flanging presses for tube plates, throat plates, &c. (served by a large double-ended furnace), vertical bending machines, &c.

In the boiler shop is a 10-ton hydraulic crane serving the hydraulic riveting machine, or "hydraulic man," two large vertical lathes for machining smokebox doors, safety valve columns, &c., at one side; a battery of fixed (single or multiple) and radial drills for boiler and tube plates, special machines for drilling foundation rings, plate edge planers, vertical circle cutting machines, bending rolls, &c. Overhead 5 or 15-ton electric travelling cranes serve each bay. The light plate shop has usual equipment. To serve the hydraulic plant, adjacent to the accumulator outside, are two duplicate double-cylinder pumping engines, using locomotive cylinders and motion. The pressure used is 1,680 lb. per square inch, and all the hydraulic power in the works is supplied from this plant. Three locomotive boilers provide steam. Alongside the boiler shop is the boiler testing shed.

Between the original group of buildings and the old polygonal running shed are the locomotive wheel and axle-box shops. The former is 190 ft. long and 70 ft. wide, in two bays, each served by a 6-ton electric travelling crane. Here cranks are built up, wheel centres and tyres turned or returned, and general wheel and axle work done. There are 16 wheel lathes with face plates up to 9 ft. diameter, and other machines as required. Hydraulic presses, fitted with recording devices, for forcing wheels on to axles, are available with capacities of from 80–120 tons. A wheel quartering machine, and presses for forcing crank pins into place, &c., may also be mentioned. In the axle-box shop are various planers, &c., and in the wheel shop extension eccentric sheaves and straps are fitted up, ready to go across to the old running shed, which is now used for wheel fitting purposes.

To the north of the older portion of the works thus far visited are various shops dealing with carriage work. The "banjo" extension of the old running shed is used as a carriage paint shop. At one time this was used for engine repairs, and it is provided with a 60-ton hydraulic crane at one end, which is still available for use if required. As adapted for carriage painting there are four roads. Alongside are carpenters' and sign-writers' shops, with a small section where "roof sticks" are bent by the usual steam process.

Immediately opposite to the locomotive wheel and axlebox shops already mentioned, and extending for a distance of 400 yards, in a northerly direction, is the main group of carriage shops. The carriage saw mill (there is another in the newer part of the works yet to be referred to) is 270 ft. long and 66 ft. wide. Among the machinery available may be mentioned circular and band saws, and moulding, morticing and tenoning, rough ing and finishing, panel planing, and rounding, thicknessing and other machines, together with rail-key and trenail machines on which work for the permanent way department is done, copying lathes for tool handles and special work, such as wheel spokes, and match-boarding machines adapted to tongue, groove and plane both sides simultaneously. At one end is an enclosure where broken band saws are welded and repaired, and band and circular saws sharpened. All belting is below, as usual in modern sawmills. A feature of this shop is the steam heating

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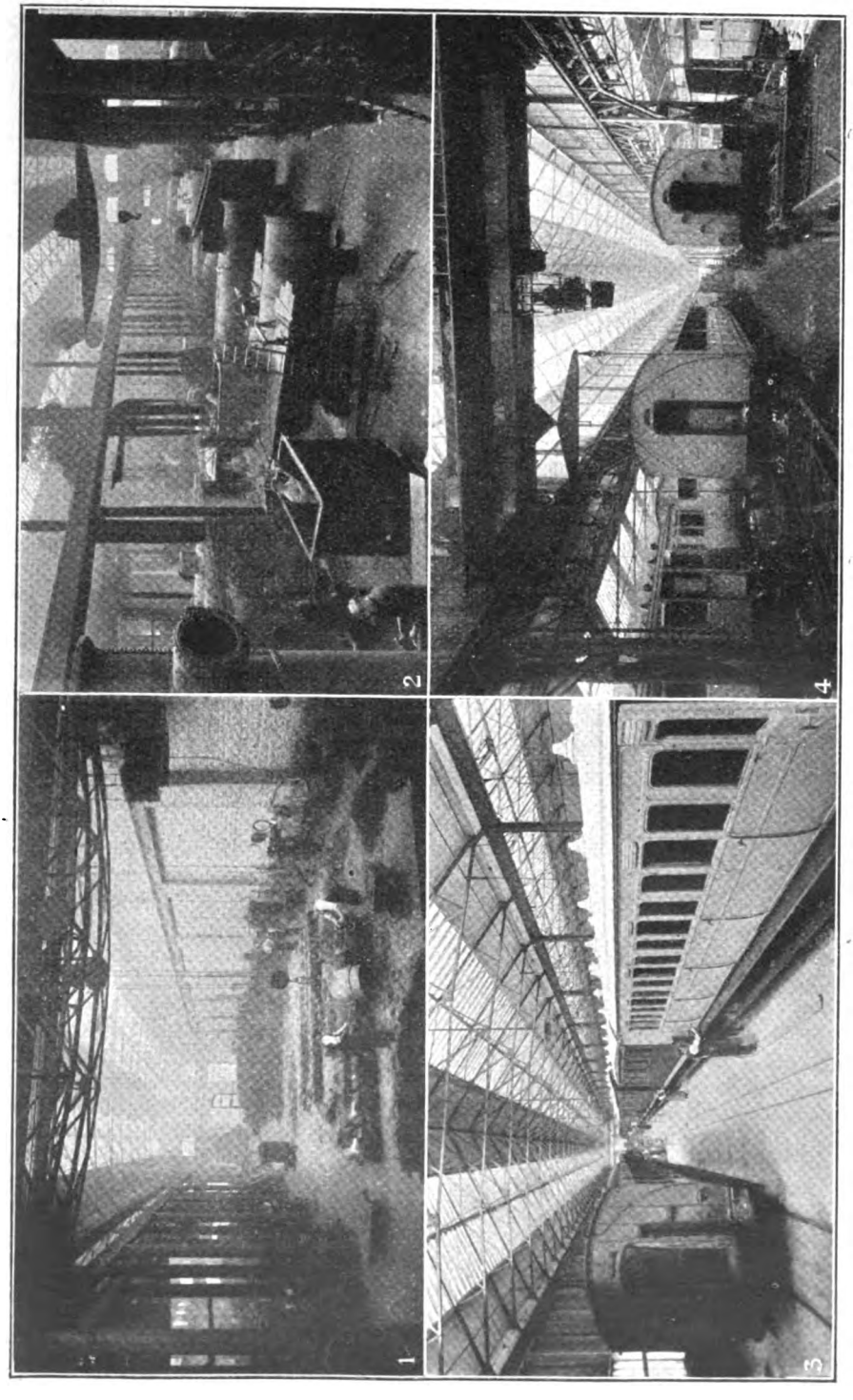

1. IRON FOUNDRY.
2. BOILER SHOP.
3. NEW CARRIAGE PAINT SHOP.
4. CARRIAGE LIFTING SHOP.

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pipes arranged about 8 ft. above ground level.

Parallel with the saw mills are the teak stores, a general carriage stores, and spaces for finishers' benches and miscellaneous carriage work. Parallel again is a further bay with a stores section at one end and carriage fitting shop beyond, while separated from this by an arcade, which at one time provided a through road for a traverser, from which access was obtained to bays on either side, is the carriage machine shop, with the "premium" office at the end. At the termination of the arcade line is an old four-wheeled three-compartment Eastern Counties Railway first-class carriage. Exteriorly this presents much its original appearance.

Beyond these shops are the body and stock shops, 370 ft. long and respectively 138 and 83 ft. wide. The body shop is so arranged that material from the saw mill can pass direct thereinto. Here are assembled the various parts until the body is ready to be placed upon the underframes. Part of the stock shop is used for painting, but otherwise general carriage work is done here. Six tracks enter each section, and these are all served by an old steam traverser built about 1870, which also serves the carriage repair and lifting shops in line with the body and stock shops. Alongside the body shop is the body shop extension, served by three lines reached directly without the aid of the traverser. The lifting shop has eight roads, two of which are served by two 15-ton overhead electric cranes, tracks on either side being also used for general repair work. Beyond are various carriage stripping and "waiting-repair" sidings. Adjacent is a vacuum cleaning plant for the treatment of upholstery removed from carriages in for repair, and a newly-erected accumulator repairing and charging shop where the batteries of train lighting plant are repaired and re-charged ready for the return of repaired vehicles into traffic.

At right angles to the carriage department machine shop is the carriage smithy, conveniently placed for transfer of work. This has a usual equipment of smiths' hearths and machines. Adjacent are the furniture shop, with hair shop above, the polishing shop, and the sewing machine shop above (both staffed by women, for whom No. 4 entrance to the works is reserved), finishing shop, offices, &c.

To complete this review of the works on the original area a few other items may be mentioned. From the subway constituting No. 1 entrance, and immediately behind No. 5 platform in the station, is a well-house where water for supplying the works is raised from a depth of 300 ft. by means of air compressed by electrically-driven pumps. Near-by is the fire station, containing a Dennis motor fire engine, and with a telephone exchange in communication with every part of the works. A permanent fireman is in charge, and members of the brigade can be at once summoned from the shops where they are employed. In the adjacent area are various stores, some belonging to the C.M.E. and some to the Stores Department. Special attention may be directed to a new building, designed to serve as a locomotive stores (on two floors), with a crane at one corner, but as yet only partially in use. On the roof are two cast-iron water tanks, giving a combined capacity of 108,000 gallons, for the general supply of the works. Near-by is a small engine shed where is stabled a powerful four-wheeled shunting engine devoted to the service of the works.

Near No. 2 gate is a range of buildings, including the hydraulic pumping plant already mentioned, copper pipe stores, white-metalling shop, local pattern stores and brass foundry. The last-mentioned has 12 coke-fired "pot hole" furnaces and one tilt furnace, two pneumatic moulding machines, a shot-blast apparatus for cleaning castings, and core-drying ovens. Opposite these is the grinding and buffing shop, with a partially open boiler testing shed. Adjacent to No. 3 gate are small shops equipped for road van repair, with timber stores, small saw-mill, paint shop, &c. To the right of No. 3 gate is a garage for motor vans and motor cars attached to the works, and accommodation for workmen's cycles. Outside the locomotive wheel shop is a hydraulic machine for forcing out rivets, and adjoining the old running shed is a 150-ton Pooley six-table weighbridge. A part of the old running shed is partitioned off to provide space for placing engines from the weighbridge under cover.

It is now necessary to pass to the newer premises on the other side of the running

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lines. These are usually reached by means of the subway under the station passing No. 1 gate which is also used by men attached to the running shed and other premises in this complicated area. This subway is necessarily limited in height, but the works fire engine is able to pass through safely whenever its services are required. On the other side of the line, immediately to the right of No. 1 gate, is a building accommodating workmen's mess rooms and stores for light carriage repairs and train-lighting plant. To the left are the oil gas works, and, in front, the electric light and power maintenance shops. Beyond are the carriage wheel and smithy stamping shops. In the former are various wood-working machines for making sections of Mansell wheels and for assembling them, together with tyre boring and turning machines, two sets of wheel-balancing apparatus, a machine for grinding axle wheel seats and journals simultaneously, and apparatus for recording the pressures required to force wheels on to axles, operating in conjunction with the wheel press. In the smithy stamping shop two sets of Brett drop stamps may be mentioned, respectively of 8, 20 and 25 cwt. and 4, 8 and 8 cwt., together with usual machinery for the manufacture of carriage springs.

To the right, in addition to gas fitters', lamp and foot-warmer shops, is a large building constituting the carriage department extension shops. The length of this building is 545 ft., and it is served by five tracks. Alongside is a range of small shops and stores serving the needs of the main shop. This building is largely used for the repair of suburban rolling-stock. The carriage-washing shop is 440 ft. long, and contains two roads. Alongside and at the further end of the carriage extension shop is the log saw mill. Outside is a gantry carrying both a 5-ton and a 6-ton overhead electric crane, serving a powerful Ransome horizontal band-saw for cutting logs into planks. Adjacent, in a small shop, is one of three French band-saw machines, brought to Stratford after service during the war. The remaining two are found in other parts of the works. Inside the saw mill are several other saws, &c., all being provided with a system of suction ducts arranged to discharge sawdust into railway wagons on adjacent lines. Beyond the saw mill is a millwrights' and crane shop.

Alongside the Victoria Park branch and the Channelsea River are various other shops, including builders', boiler repairing and tube, tender, paint and engine-stripping shops, together with the iron foundry and pattern shops and stores, while at the extreme end of the works area may be noted the main timber stores. The iron foundry is a new building completed in February, 1912. Half the floor space is devoted to machine moulding, with hydraulic, pneumatic and hand moulding machines, and is paved with cast-iron plates. On the floor moulding side next to the cupolas the floor is, of course, of sand, with three deep pits to accommodate the larger castings, such as cylinders. The trimming area is at one end, across both bays. The heavy castings side is served by two 15-ton electric overhead travelling cranes, while the machine-moulding bay has a smaller crane of 3 tons capacity. Four cupolas are provided at one side, two having a capacity of 2 tons 12 cwt., and the others of 5 tons per hour. They are fed by means of "Jacob's Ladder" hoists, while the blowing machinery and an air compressor for small moulding machines are placed in an underground chamber. In line with the cupolas are core ovens heated by outside furnaces, and other equipment includes sand riddling and mixing machines, loam mills, and core makers' shop. The pattern makers' shop runs the whole length of the foundry and is placed over the pattern stores. The foundry yard is served by a 5-ton Scotch derrick crane. The boiler repairing and tube shop is in two bays, that used for boiler work being served by a 15-ton overhead electric crane. The tender shop has three pits, and is served by two 20-ton overhead electric travelling cranes. At the end is a small machine shop with air compressors for pneumatic tools.

Beyond the running sheds the principal feature is the new engine repair shop, a building erected during the war. It is 480 ft. long, in three bays averaging 50 ft. wide, with a wall height of 38 ft. Each of the side bays has three continuous pits roads, and together accommodate 40 to 50 locomotives. Each is served by two 40-ton overhead travelling cranes,

operating at a height of 27 ft. above rail level, so that a locomotive can be lifted from, or lowered into, any position and carried over other engines on the same track. Provision is made for the installation of lighter travelling cranes to run underneath and at a height of 19 ft. above rail level. The centre bay is designed to serve those on either side. One portion is used as a stores for locomotive details; another portion accommodates several smiths' hearths with hoods for withdrawing smoke and fumes; a small axle box shop is placed in an enclosure, while further sections provide space for fitting and copper smiths' work. reached by an entrance from Temple Mills Lane, used also by men passing to the running sheds from that direction. Its erection is part of a scheme for further extensions when required, a large area having already been levelled in view of the probable need for further extending and developing the carriage department As erected, the new shop, which is 420 ft. long and 84 ft. wide, has one side completed with corrugated iron, so that it may be widened when required. At one corner are the paint and general stores, partly used for minor repairs, and the main building (which is notable for its splendid lighting) contains four

THE CARRIAGE DEPARTMENT SAW-MILL.

The foreman's office is placed in the centre of the shop, over the middle bay. Several machines, including wheel lathes, grinding and other tools, are also available. A portion of the outer bay on one side is utilised mainly for boiler repairs. Alongside this shop an Avery 6-table weighbridge has just been added, designed for total weights up to 180 tons. This is of a recent design and differs from older types in that the tables are formed with pits to enable attention to be given under an engine while upon the table.

One further shop requires attention—that located to the extreme north of the works area. This is the new carriage paint shop completed in 1916. It is roads unusually widely spaced, so that there is room for the movement of trolleys, notwithstanding the erection of painters' platforms and ladders against vehicles, between each line. Steam heating pipes, placed 8 ft. above ground level, run throughout the shop. At the end is the usual washing accommodation.

It will be seen that throughout the works at Stratford special attention has been given to the comfort of workmen. Electric power, obtained from the company's power station on the other side of the Channelsea River, is universal, except for operating the hydraulic pumping engines, for the steam hammers (use is made of the furnace gases for steam

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raising), and where hydraulic, or in some cases pneumatic power, is essential. Group driving of machinery is usual, and nowhere is there the forest of driving belts and overhead shafting once so characteristic of large machine shops. Current is three-phase alternating, 50 periods, 440 volts, used without conversion, the motors being usually of 5, 10, 15, 20, 25, 30 and 40 h.p., with a few of 75 h.p.

During the war a great deal of special war work was undertaken at Stratford. In the boiler shop the powerful hydraulic presses were at work almost night and day on shell bands, hemispherical mines, shell forgings, &c. The brass foundry was busy casting copper shell bands, fuse sticks, &c. The new engine repair shop built in 1916 was first used for war purposes. Several hundred women were employed about the works repairing cartridges and on fuse and shell work. And the carriage shops adapted their resources to the construction of general service vans, stretchers, equipment of ambulance trains, &c.

The whole of the Chief Mechanical Engineer's department is under the direction of Mr. Hill, to whom are directly responsible Mr. C. W. L. Glaze, Works Manager and Chief Assistant to the Chief Mechanical Engineer; Mr. A. W. Headley, Chief Clerk (well known also as the energetic General Secretary of the Great Eastern Railway Musical Society); Mr. D. Sayer, Locomotive Accountant; Mr. E. S. Tiddeman, Chief Draughtsman; Mr. J. H. B. Jenkins, Chief Chemist; and Mr. F. Duce, Outdoor Assistant. Mr. T. O. Mein is Assistant Works Manager, and Mr. G. Caster has charge of the new engine repairing shop near the running sheds; Mr. Haydon Parker, O.B.E., is Carriage Works Manager; and Mr. C. Spencer Wagon Works Manager (at Temple Mills). Mr. W. F. MacDermid is in charge of the Works Drawing Office, and as such is responsible largely for the lay-out and equipment of the shops, machinery and plant. At several places on the system are workshops which are, in effect, sections of Stratford Works. Mr. A. Glaze is in charge of the shops at Stratford attached to the running sheds; Mr. W. Pollock at Cambridge; Mr. A. Woolford at Ipswich; and Mr. J. Sparke at Norwich.

Mr. Hill went to Stratford in 1877, passed through a course of training in the workshops and drawing office of the Locomotive, Carriage and Wagon Department, and in 1882 obtained a Whitworth Scholarship. After acting for some years as Assistant Works Manager, he was, in January, 1899, appointed Manager of the Locomotive, Carriage and Wagon Works. He was largely instrumental in the extension of ambulance work on the Great Eastern Railway, and for many years acted as Honorary Secretary to the Company's Ambulance Corps. For 12 years he was also Chairman of the Committee of the Great Eastern Mechanics' Institute, where apprentices and others employed in the Locomotive Department receive a large proportion of their technical education. Mr. Hill is a member of the Institution of Mechanical Engineers. To the former institution he has contributed papers on "The Use of Cast Steel in Locomotives" and "The Repairs and Renewals of Railway Rolling-Stock." For the first-named he received a Miller prize and for the last a Watt medal and a Crampton prize. Towards the close of 1912 he was appointed to his present position, taking the title of Chief Mechanical Engineer in 1915.

Mr. Glaze was trained at Stratford and after being District Locomotive Superintendent successively at Doncaster, Norwich and Stratford, became Works Manager on Mr. Hill's promotion to be head of the department

Mr. Mein is also a Stratford-trained man and has held his post of Assistant Works Manager since January, 1899. He is a Whitworth Scholar.

Mr. Jenkins came to Stratford from the Great Western Railway at Swindon and has been the head of the Stratford Laboratory since December, 1892.

Mr. Headley has been Chief Clerk and Cashier of the department since January, 1903, prior to which he had for some years been Principal Assistant to Mr. A. P. Parker (now Assistant to the General Manager), whom he succeeded.

Mr. Sayer has been with the company since December, 1895, and became Assistant Accountant at Stratford in July, 1914, succeeding as Accountant on the death of Mr. A. J. Snow a few months ago.

Mr. Haydon Parker received his early

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training at Stratford but migrated to the Lancashire and Yorkshire Railway, returning as foreman in the Carriage Department in February, 1888. A year later he was appointed assistant to Mr. W. Hammond, Manager of the Carriage Department, whom he succeeded in July, 1903.

Mr. Spencer joined the Coaching Department at Cambridge in 1873 and came to Stratford shops about four years later as an apprentice fitter. On completing his apprenticeship he was away from the company for a short period, rejoining the service in April, 1883. He became a foreman fitter in April, 1896, and Manager of the Wagon Shops at Temple Mills in May, 1907.

Mr. Duce entered the service at Cambridge and became a draughtsman at Stratford in February, 1892. After acting for several years as a foreman in the Erecting Shop, he was attached to the Outdoor Section of the Department, of which he became chief in May, 1915.

Mr. Tiddeman started his railway career at Stratford in October, 1882, as a pupil to Mr. T. W. Worsdell, and was afterwards placed in the Drawing Office, of which he became chief on the retirement of Mr. W. D. Craig in July, 1907.

Mr. Caster, after serving an apprenticeship at Stratford, was appointed to the Drawing Office in July, 1908. He served with the Forces throughout the war, returning to Stratford in September, 1919, to take up the management of the new engine repair shop.

In conclusion, the writer would express his indebtedness to Mr. Hill for facilities to visit the works in detail and co-operation in regard to the preparation of this article, to his chief assistants for the very material assistance rendered by each, and to Mr. McDermid for his invaluable services as guide and informant and in regard to time willingly given over to a necessarily lengthy tour of the Great Eastern Railway mechanical engineering headquarters—"Stratford Works."

In the August RAILWAY MAGAZINE the Wagon Works at Temple Mills will be described, and reference made to the locomotives, carriages and wagons in use on the Great Eastern Railway. A further series of portraits of Chief Officers mentioned above will then be reproduced.

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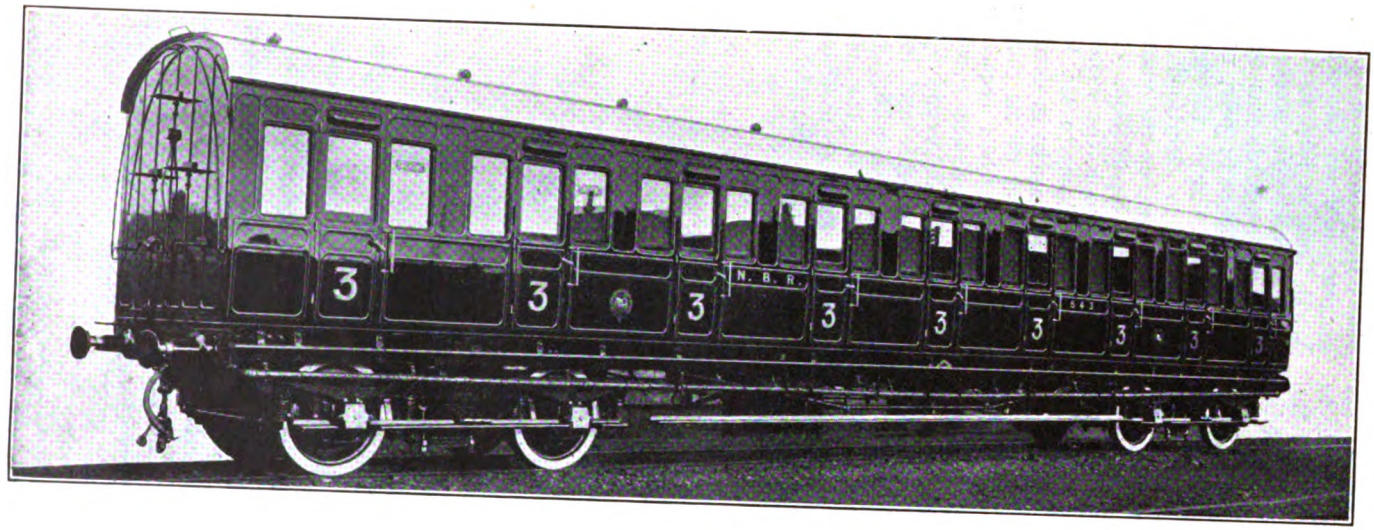
NEW PASSENGER ROLLING-STOCK ON THE NORTH BRITISH RAILWAY.



TWENTY third-class non-corridor bogie carriages have been built by R. Y. Pickering & Co., Limited, for the North British Railway. The steel underframes are 57 ft. $7\frac{7}{8}$ in. long over headstocks and 61 ft. $2\frac{7}{8}$ in. long over buffers. The bogies are of the pressed steel type and have a wheelbase of 8 ft., the centres being arranged 42 ft. $5\frac{7}{8}$ in. apart. The bodies are 58 ft. 4 in. long over ends and are divided into nine compartments, two at either end being arranged as smoking compartments. The width over the body is 8 ft. 6 in. The bodies are constructed largely of teak with outside panelling of mahogany. Seats are of woven wire and upholstered in French carpet of the North British Railway pattern. Vacuum brake fittings, electric lighting on the single battery system, and non-storage steam heating are provided.

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British Locomotive Practice and Performance.

By CECIL J. ALLEN,
A.M.Inst. T., A.I.Loco.E.

Photo.] GREAT CENTRAL RAILWAY. [*H. L. Salmon.*

Down Sheffield express near Leicester.
Engines: 4-4-2, No. 263 and 4-4-0, No. 1020.

IN the June, 1920, RAILWAY MAGAZINE I gave some tabular statements showing the distribution on British railways of the various tender and tank engine wheel arrangements, based on the figures given in the 1920 RAILWAY YEAR BOOK in regard to locomotive stocks at the end of the previous year. As these tables appeared by subsequent correspondence to be of considerable value to readers generally, I am repeating them, the information being brought up to the conclusion of 1920. The scope of the tables is somewhat enlarged, as this time I have included all railways owning 15 locomotives or over, instead of 100 or over; this brings in some of the smaller lines, such as the County Donegal Joint Committee, whose locomotives are noteworthy from the wheel arrangement point of view. I have also worked out the percentage of each wheel arrangement to the grand totals, and the percentage of tender and tank engines to the total on each individual railway, the figures thus obtained being instructive. Certain railways owning between 15 and 100 engines will be seen to be absent from the tables, the information in their case not being obtainable; the Brecon and Merthyr, Rhondda and Swansea Bay, Port Talbot and Cardiff Railways are, I think, the only ones so omitted. For the benefit of readers not acquainted with some of the lesser-known lines I may add that "A. (N.) D. & R." stands for Alexandra (Newport and South Wales) Docks and Railway, "C.B. & S.C.R." for the Cork, Bandon and South Coast Railway of Ireland, "L. & L.S.R." for the Londonderry and Lough Swilly, and "N.C.C." for the Northern Counties Committee (now belonging to the Midland) of the same country.

In regard to the large groups of wheel arrangements it is striking to notice that not only do six-coupled engines constitute well over one-half of the total railway locomotive stock of these islands, but the percentage of six-coupled tender and tank engines is precisely the same in both instances, viz., 57·9. Four-coupled locomotives comprise 31·8 per cent. of the tender and 38·4 per cent. of the tank totals, and eight-coupled 9·6 and 2·2 per cent., respectively. Of individual wheel arrangements the 0-6-0 is far and away the most popular, 48·1 per cent. of the tender engines and 37·8 of the tank, or 44·1 per cent. of the grand total, being of this type. On individual railways, too, the largest single figure in both tender and

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RAILWAY.	Single.	Four-coupled.					Six-coupled.				Eight-coupled.		Ten-coupled	Total Tender and Tank	Tender engines.	
	4-2-2	0-4-0	0-4-2	2-4-0	4-4-0	4-4-2	0-6-0	2-6-0	4-6-0	4-6-2	0-8-0	2-8-0	0-10-0		Total.	Per cent.
Barry R.	—	—	—	—	—	—	—	—	—	—	4	—	—	148	4	3
B. & C.D.R.	—	—	—	4	—	—	4	—	—	—	—	—	—	33	8	24
Caledonian R.	1	—	30	2	163	—	389	5	53	—	8	—	—	1069	651	61
Cambrian R.	—	—	—	5	35	—	35	—	—	—	—	—	—	97	75	77
D. & S.E.R.	—	—	8	5	6	—	11	—	—	—	—	—	—	64	30	47
Furness R.	—	—	—	1	20	—	65	—	—	—	—	—	—	141	86	61
G. & S.W.R.	—	1	56	6	180	—	179	11	19	—	—	—	—	532	452	85
G.C.R.	6	—	—	7	146	31	410	—	60	—	89	146	—	1356	895	66
G.E.R.	—	—	—	100	171	—	442	—	62	—	—	—	—	1322	775	59
G.N.R.	—	—	32	62	136	116	410	56	—	—	55	21	—	1365	888	65
G.N.R. (I.)	—	—	—	8	75	—	89	—	—	—	—	—	—	204	172	84
G.N.S.R.	—	—	—	—	101	—	—	—	—	—	—	—	—	123	101	82
G.S. & W.R.	—	—	—	12	85	—	135	11	7	—	—	—	—	320	250	78
G.W.R.	—	—	—	73	368	3	396	294	138	1	—	105	—	3177	1378	43
Highland R.	—	—	—	3	80	—	12	—	46	—	—	—	—	169	141	83
H. & B.R.	—	—	—	9	5	—	91	—	—	—	15	—	—	181	120	66
L. & Y.R.	—	—	—	1	71	40	540	—	20	—	294	—	—	1068	966	58
L. & N.W.R.	—	—	—	135	300	—	688	—	530	—	482	30	—	3268	2165	66
L. & S.W.R.	—	—	90	—	*308	—	79	—	59	—	—	—	—	926	536	58
L.B. & S.C.R.	—	—	26	—	58	11	66	14	—	—	—	—	—	611	175	29
M. & C.R.	—	—	7	4	—	—	17	—	—	—	—	—	—	33	28	85
Midland R.	92	—	—	259	386	—	1533	—	—	—	—	—	1	3019	2271	75
M. & G.N.J.R.	—	—	—	—	55	—	28	—	—	—	—	—	—	100	83	83
M. & S.W.J.R.	—	—	—	3	10	—	10	1	—	—	—	—	—	29	24	83
M.G.W.R.	—	—	—	32	22	—	68	—	—	—	—	—	—	139	122	88
N.B.R.	—	3	—	6	203	20	525	—	—	—	—	—	—	1107	757	68
N.E.R.	10	—	—	47	185	72	719	—	89	—	211	—	—	2030	1333	66
N.S.R.	—	—	—	—	5	—	48	—	—	—	—	—	—	105	53	27
N.C.C. (I.)	—	—	1	25	22	—	16	—	—	—	—	—	—	84	64	76
S. & D.J.R.	—	—	—	—	13	—	41	—	—	—	—	6	—	86	60	70
S.E. & C.R.	—	—	—	—	248	—	203	6	—	—	—	—	—	733	457	62
T.V.R.	—	—	—	—	—	—	42	—	—	—	—	—	—	259	42	16
Railways with no tender engines	—	—	—	—	—	—	—	—	—	—	—	—	—	309	—	
TOTAL	109	4	250	809	3457	293	7291	398	1083	1	1158	308	1	24957	15162	60·7
% of Grand Total	0·7	—	1·7	5·4	22·8	1·9	48·1	2·6	7·2	—	7·6	2·0	—	—	100·0	—

* Includes six engines with uncoupled driving wheels (4-2-2-0 type).

ANALYSIS OF TENDER LOCOMOTIVE WHEEL TYPES ON BRITISH RAILWAYS.

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tank engine classes is in the 0-6-0 columns, the Midland Railway having no less than 1,533 of the former, and the Great Western the somewhat staggering total of 1,100 of the latter. In fact, only two out of 32 railways figuring in the tender engine table have no 0-6-0 tender engines, and only three (in each case with very small locomotive stocks) out of 40 no 0-6-0 tank engines. The nearest approach to such popularity is found in that characteristic British express type—the 4-4-0—which figures to the extent of 22·8 per cent. of the tender locomotive total. It is significant that 91·1 per cent. of the tender engine aggregate is made up of 2-4-0, 4-4-0, 0-6-0, 4-6-0 and 0-8-0 locomotives, and 81·4 per cent. of the tanks by 2-4-0, 0-4-4, 4-4-2, 0-6-0 and 0-6-2 engines, no wheel arrangement other than the 10 mentioned, out of 38 in all, boasting a percentage as high as five of either tender or tank totals.

Eight railways have no tender engines at all, and in all cases they operate either short distance passenger traffic (such as the Metropolitan, North London and Wirral Railways), or general or mineral traffic over short hauls, such as the Welsh lines. We might really include among the latter, for practical purposes, the Barry and Taff Vale Railways also, the few tender engines possessed by both—0-8-0 in the former case and 0-6-0 in the latter—being of more or less obsolete types. It will be seen that the general proportion of tender to tank engines is about three-fifths to two-fifths, taking the locomotive stock as a whole, and with certain notable exceptions the bulk of the large companies conform to this proportion. Striking among these exceptions is the case of the Great Western Railway, with 43 per cent. tender to 57 per cent. tank engines, and, conversely, the case of the Midland Railway is worthy of note, with 75 and 25 per cent. respectively. A high proportion of tank engines on such lines as the North Stafford or the London, Brighton and South Coast Railways is, of course, to be expected.

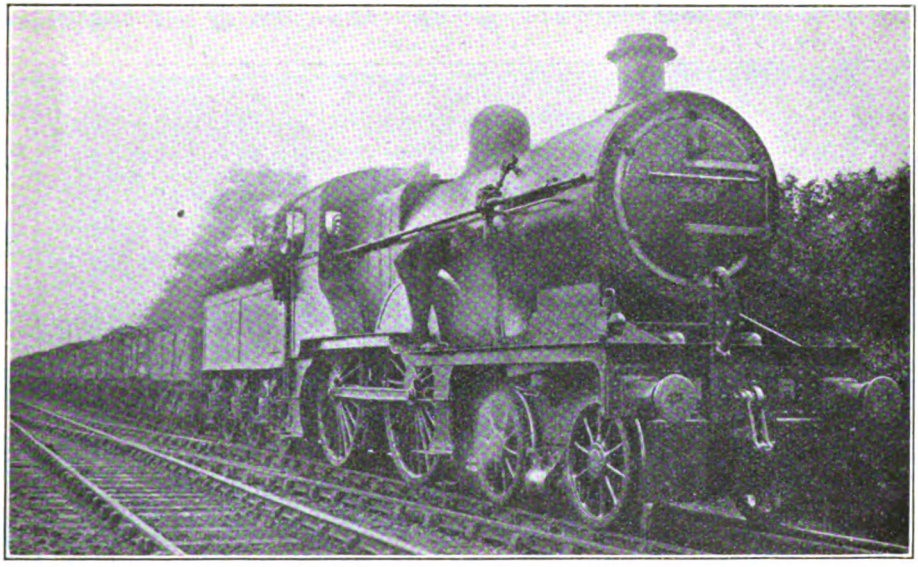

Photo.] MIDLAND RAILWAY. [*W. H. Whitworth.*

4-4-0 superheater locomotive, No. 425, on goods train.

It is interesting to note which railways take the lead in regard to the most popular wheel arrangements. The Midland Company does so in respect of every column in which it figures among the tender engines: 4-2-2, 2-4-0, 4-4-0 and 0-6-0 (not to mention 0-10-0!); the London and North Western Railway has by far the most 4-6-0's and 0-8-0's, and the Great Central the most "Consolidations," while the Great Northern naturally takes the

RAILWAY.	Single.			Four-coupled.								Six-coupled.									Eight-coupled.						Steam Rail Motors.	Total Tender and Tank.	Tank Engines.	
	2-2-0	2-2-2	2-2-4	0-4-0	0-4-2	2-4-0	2-4-2	0-4-4	4-4-0	4-4-2	4-4-4	0-6-0	2-6-0	0-6-2	2-6-2	4-6-0	0-6-4	4-6-2	2-6-4	4-6-4	0-8-0	0-8-2	2-8-0	0-8-4	4-8-0	4-8-4			Total	Per cent.
A. (N.) D. & R. ..	—	—	—	2	1	—	—	—	—	—	—	21	—	3	7	—	3	—	—	—	—	—	—	—	—	—	—	37	37	100
Barry R. ..	—	—	—	—	—	13	4	—	—	—	—	38	—	72	—	—	10	—	—	—	—	7	—	—	—	—	—	148	144	97
B. & C.D.R. ..	—	—	—	—	4	—	6	—	—	8	—	—	—	—	—	—	—	—	—	4	—	—	—	—	—	—	3	33	25	76
Caledonian R. ..	—	—	—	46	2	—	—	140	12	—	—	200	—	—	—	—	—	12	—	—	6	—	—	—	—	—	—	1069	418	39
Cambrian R. ..	—	—	—	—	—	6	—	6	4	—	—	4	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	97	22	23
C.B. & S.C.R. ..	—	—	—	—	—	1	—	—	2	3	—	5	—	—	—	9	—	—	—	—	—	—	—	—	—	—	—	20	20	100
C.D.J.C. ..	—	—	—	—	—	1	—	—	—	—	2	—	—	—	—	6	—	—	8	4	—	—	—	—	—	—	—	21	21	100
D. & S.E.R. ..	—	2	—	1	2	12	13	—	—	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	64	34	53
Furness R. ..	—	—	—	1	—	—	2	—	—	6	—	18	—	23	—	—	—	—	—	4	—	—	—	—	—	—	1	141	55	39
G. & S.W.R. ..	—	—	—	10	—	—	—	21	—	—	—	18	—	28	—	—	—	—	—	—	—	—	—	—	—	—	3	532	80	15
G.C.R.	—	—	—	2	—	6	49	6	—	52	—	83	—	205	—	—	9	21	20	—	1	—	—	4	—	—	3	1356	461	34
G.E.R.	—	—	—	12	—	—	235	40	—	—	—	258	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	1322	547	41
G.N.R.	—	—	—	—	—	—	—	42	—	60	—	265	—	63	—	—	—	—	—	—	—	41	—	—	—	—	6	1365	477	35
G.N.R. (I.) ..	—	—	—	1	—	—	6	—	10	5	—	2	—	4	—	—	4	—	—	—	—	—	—	—	—	—	—	204	32	16
G.N.S.R.	—	—	—	—	4	—	—	9	—	—	—	9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	123	22	18
G.S. & W.R. ..	—	—	—	2	3	—	7	19	—	14	—	18	—	2	—	—	4	—	—	—	—	—	—	—	1	—	—	320	70	22
G.W.R.	—	—	—	5	154	122	36	—	1	31	—	1100	—	26	167	—	2	—	—	—	—	5	85	—	—	—	65	3177	1799	57
Highland R. ..	—	—	—	—	—	1	—	5	8	—	—	6	—	—	—	—	8	—	—	—	—	—	—	—	—	—	—	169	28	17
H.& B.R.	—	—	—	6	—	—	—	—	—	—	—	31	—	24	—	—	—	—	—	—	—	—	—	—	—	—	—	181	61	34
L. & Y.R.	—	—	—	62	—	1	332	1	—	—	—	243	—	22	18	—	—	—	—	—	—	5	—	—	—	—	18	1668	702	42
L. & N.W.R. ..	—	—	—	17	20	15	248	—	3	50	—	293	—	373	—	—	—	47	—	—	—	30	—	—	—	—	7	3268	1103	34
L. & S.W.R. ..	2	—	—	31	—	3	—	215	—	80	—	55	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	926	390	42
L.B. & S.C.R. ..	—	—	—	—	112	—	—	36	—	62	—	86	—	134	—	—	—	2	—	2	—	—	—	—	—	—	2	611	436	71
L. & L.S.R. ..	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	4	—	8	—	—	—	—	—	—	—	2	—	15	15	100
M. & C.R. ..	—	—	—	2	—	1	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	33	5	15
Metropolitan R. ..	—	—	—	—	—	3	—	8	13	—	4	2	—	4	—	—	4	—	—	—	—	—	—	—	—	—	—	38	38	100
Midland R. ..	—	—	—	33	—	—	—	228	—	70	—	355	—	14	—	—	40	—	—	8	—	—	—	—	—	—	—	3019	748	25
M. & G.N.J.R. ..	—	—	—	—	—	—	—	—	3	3	—	11	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	100	17	17
M. & S.W.J.R. ..	—	—	—	—	—	—	—	1	—	—	2	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	29	5	17
M.G.W.R. ..	—	—	—	—	—	—	—	—	—	—	—	17	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	139	17	12
N.B.R.	—	—	—	38	—	—	—	29	31	45	—	132	—	75	—	—	—	—	—	—	—	—	—	—	—	—	—	1107	350	32
N.E.R.	—	—	4	24	—	—	60	182	—	—	27	258	—	102	—	—	—	30	—	—	—	—	—	—	10	—	—	2030	697	34
N.L.R.	—	—	—	—	1	—	—	—	77	—	—	21	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	99	99	100
N.S.R.	—	—	—	—	—	19	6	9	—	7	—	53	—	29	—	—	16	—	—	—	—	—	—	—	—	—	3	195	142	73
N.C.C. (I.) ..	—	—	—	5	—	5	6	—	—	—	—	3	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	84	20	24
Rhymney R. ..	—	—	—	—	—	—	2	—	—	—	—	33	—	88	—	—	—	—	—	—	—	—	—	—	—	—	—	123	123	100
S. & D.J.R. ..	—	—	—	2	1	2	—	13	—	—	—	8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	86	26	30
S.E. & C.R. ..	—	—	—	—	3	—	—	213	—	—	—	46	—	—	—	—	5	—	1	—	—	—	—	—	—	—	8	723	276	38
T.V.R.	—	—	—	—	—	—	—	—	3	6	—	11	—	197	—	—	—	—	—	—	—	—	—	—	—	—	—	259	217	84
Wirral R.	—	—	—	—	—	—	3	8	—	1	2	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	16	16	100
TOTAL ..	2	2	4	302	307	198	1024	1236	167	507	37	3707	1	1490	194	19	107	120	29	22	7	88	85	4	11	2	123	24957	9795	39·3
% of Grand Total	—	—	—	3·1	3·1	2·0	10·5	12·6	1·7	5·2	0·4	37·8	—	15·3	2·0	0·2	1·1	1·2	0·3	0·2	0·1	0·9	0·9	—	0·1	—	1·3	—	100·0	—

ANALYSIS OF TANK LOCOMOTIVE WHEEL TYPES ON BRITISH RAILWAYS.

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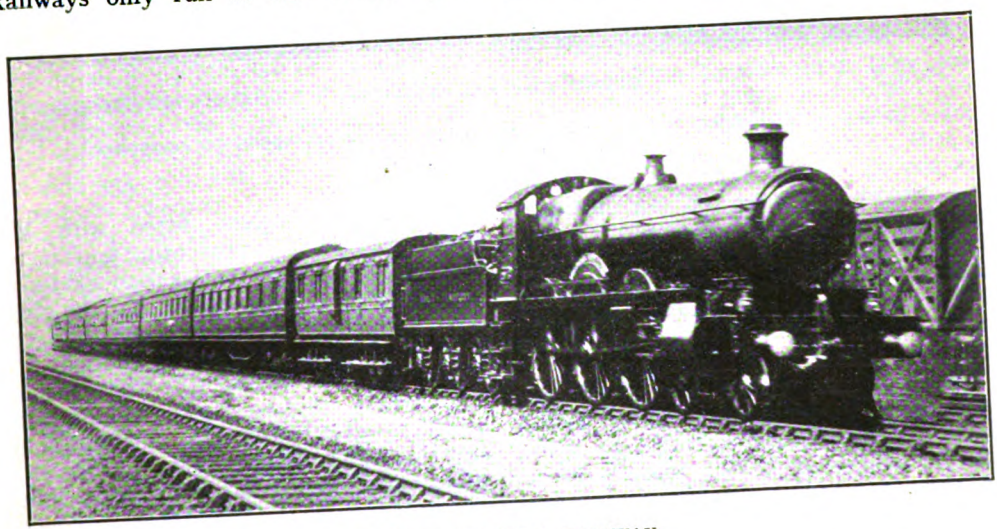
palm for "Atlantics." As regards tank engines the Midland comes next to the Great Western Railway in respect of 0-6-0's, and takes the lead in 0-4-4's (although closely approached in the latter case by the London and South Western and South Eastern and Chatham Railways); the London and North Western has it in 0-6-2's, and the Lancashire and Yorkshire in 2-4-2's. For the largest number of different wheel arrangements owned by any one railway the Great Central and Great Western tie with 21 each—8 tender and 13 tank in each case. On the other hand the Barry, Great North of Scotland and Taff Vale Railways only run to one tender type apiece—0-8-0, 4-4-0 and 0-6-0, respectively—and the Midland Great Western of Ireland to one tank type only—the 0-6-0. The Great North of Scotland, indeed, lays claim to only four wheel arrangements altogether.

One column only vanishes from the tables—the 2-6-2 tender—owing to the Midland Company having now broken up the experimental engine No. 2299, but several new columns appear in the tank tables, owing to the inclusion of certain of the smaller railways, as previously mentioned. These columns are the 2-2-2, 2-6-0, 4-6-0 and 4-8-4, but none of the engines referred to are new. Steam rail motor cars are now included, seeing that really they rank as tank engines of small dimensions, even though carried permanently on a passenger coach frame. All wheel arrangements to the left of (and representing for the most part engines smaller or of less power than) the 4-4-0 in tender engines, or the 2-4-2 in tank engines prove on analysis to be diminishing in numbers from last year. Many further interesting deductions might be drawn from these tables, especially as regards the engines which have been built or scrapped on each railway, as the case may be, during the past year, but considerations of space forbid, and I must hurry on to "Performance."

I had hoped in the present issue to begin describing locomotive work on the accelerated main line schedules which were promised us in May, but the coal dispute alas, has had the effect of postponing those improvements *sine die*. Nevertheless, "its an ill wind that blows nobody any good," and the familiar adage might certainly be quoted in regard to recent records of locomotive running, that is to say, if the recorder is careful to pick his trains! Even a journey of five hours over the 115 miles from Norwich to London with stops at all stations for 95 miles continuously, had its features of interest the other day. From Ipswich to London the 61-axle train was one of 400 tons gross weight, but a 4-6-0 worked it into Liver-



GREAT WESTERN RAILWAY.

Up South Wales express near Hayes. 4-6-0 locomotive, No. 2973, "Robins Bolitho."

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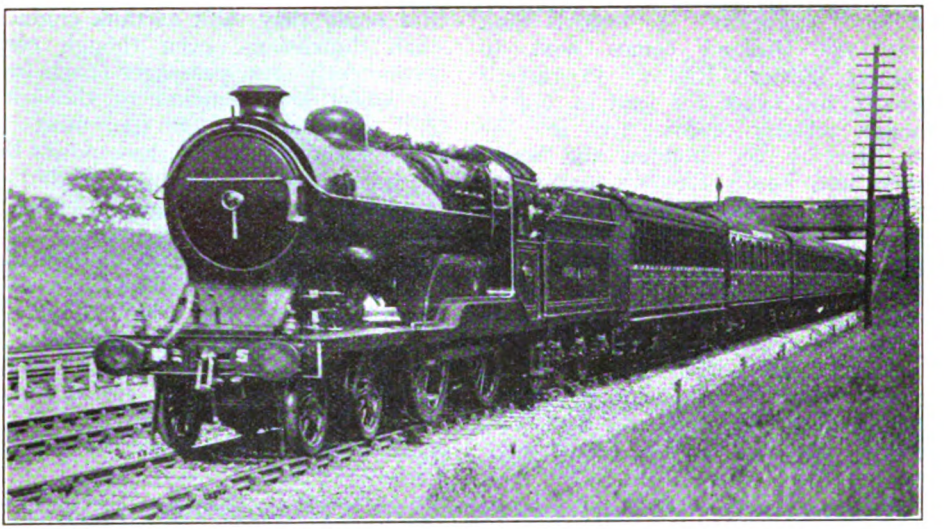

Photo.] GREAT CENTRAL RAILWAY. [*F. E. Mackay.*

3.15 p.m. Marylebone–Manchester express near Harrow. 4-4-0 superheater locomotive, No. 510, "Princess Mary."

pool Street on time, on an ordinary stopping train schedule, despite the necessity for drawing up twice at several stations. The 13 miles from Shenfield to Ilford, too, were run quite smartly in under 17 min., with a top speed of 70 m.p.h. on Brentwood Bank!

On some lines the running has been astonishing in character. The Great Northern, in particular, has had some colossal trains at work, running up to 17 and 18 corridor coaches and more, and with no increase in point-to-point running times, which in my experience have been observed. I hope to devote the whole of my next article to a thorough analysis of the work performed on the Great Northern Railway with tremendous loads, both by "Atlantics" and "Moguls." Among the runs the "1000" class three-cylinder engines figure, and also the new 0-6-2 tanks as pilots out to Potter's Bar. For the present, however, I will confine myself to the description of one or two runs on the Great Central Railway, on which loads well over the normal were taken, without any increase at all in journey times.

The first was one on the 3.15 p.m. down Manchester express, when we were hauled to Leicester by one of the new "Director" class 4-4-0 engines, No. 510, *Princess Mary*. Load consisted of eight of the largest eight-wheelers, fitted with Mr. Robinson's collision-preventing appliances, and weighing empty no less than 296 tons; every seat was occupied, so that the gross load from the start was not less than 315 tons. We passed Neasden Junction, 5·0 miles, in 9 min. 40 sec. (the first 2¾ miles are entirely adverse, and conclude with a mile up at 1 in 100–87), at 57½ m.p.h., and Harrow, 9·2 miles, in 14 min. 40 sec., speed falling to 39½ m.p.h. on the 1½ miles at 1 in 105–94 to the latter point. Touching 59 m.p.h. at Pinner, we fell to 50 at Northwood (a mile up at 1 in 145), the 4·5 miles from Harrow taking 5 min. 10 sec., and passed Rickmansworth, 17·2 miles, in 23 min. 30 sec., after a very leisurely descent of Sandy Lodge bank, not exceeding 62½ m.p.h. Slacking severely as usual through Rickmansworth, we fell to a steady 32 m.p.h. up the six miles at 1 in 105 to Amersham, the 6·4 miles between the two last-mentioned stations taking 11 min. 20 sec.; load considered, this was an excellent feat.

Touching 69 m.p.h. on Missenden "dip" and falling to 48 up the subsequent 1⅝ miles at 1 in 145–157, we reached 79 m.p.h. on Wendover bank; our times were 34 min. 50 sec. to Amersham, 23·6 miles; 40 min. 20 sec. to Missenden, 28·8 miles; 45 min. 10 sec. to Wendover, 33·3 miles; 49 min. 10 sec. to Aylesbury, 38 miles;

and 55 min. to Quainton Road Junction, 44·4 miles. We slackened speed very slightly through Aylesbury, and fairly severely over the junction at Quainton Road. Grendon Junction, 46·8 miles, was passed in 57¾ min., and Calvert, 48·8 miles, in 59¾ min., speed recovering to 61 m.p.h. on the slight subsequent dip. Then follow two long ascents, the five miles of Finmere bank and the 4½ of Brackley bank, including three and four miles respectively at 1 in 176; on the former we fell to 43½ and on the latter 45 m.p.h., with a maximum of 60 on the 1¼ miles down at the same inclination beyond Finmere. So Finmere, 54·5 miles, was passed in 66 min.; Brackley, 59·3 miles, in 71 min. 40 sec.; Helmdon, 62·5 miles, in 75 min. 50 sec.; and Culworth, 66·1 miles, in 79 min. 40 sec. Touching 65 m.p.h. on the 1¾ falling miles to Culworth Junction, we were through Woodford, 69·1 miles, in 82 min. 35 sec., and had 33½ min. left for the remaining 34 miles to Leicester.

Such was our speed on the concluding stage, however, that this comparatively limited allowance proved 2 min. more than was required. Falling to 55 m.p.h. on the 1¼ miles at 1 in 176 up to Charwelton, we reached a well-sustained maximum of 80½ m.p.h. at Braunston; a minimum of 64½ m.p.h. at Rugby was succeeded by a maximum of 72½ at Shawell; and lowest speeds of 55 and 54 m.p.h. on the two stages of Lutterworth bank, with a top speed of 62½ through the station (3 miles up, 1 mile down, and 1¾ miles up, all at 1 in 176), were followed by a very rapid descent of Ashby bank, the highest speed reached being again 80½ m.p.h. So we passed Charwelton, 71·5 miles, in 85 min. 5 sec.; Braunston 78·5 miles, in 91¼ min.; Rugby, 83·2 miles, in 95 min. 10 sec.; Lutterworth, 90 miles, in 101¾ min.; Ashby, 93·9 miles, in 105 min. 40 sec.; Whetstone, 98·4 miles, in 109¼ min.; Leicester Goods Junction, 102·5 miles, in 112¾ min.; and reached Leicester, 103·1 miles, in 114 min. precisely. That is to say, by gaining 2 min. on schedule we had run down from London in a time only 5 min. or 4·6 per cent., in excess of the pre-war time of 109 min., and with a load exceeding by exactly 75 per cent. that of the almost invariable five-coach pre-war train. Among especially noteworthy travelling times may be mentioned 77 min. 55 sec. for the 78·9 miles from Amersham to Leicester Goods, and 27 min. 40 sec. for the 31 miles from Charwelton to the same point.

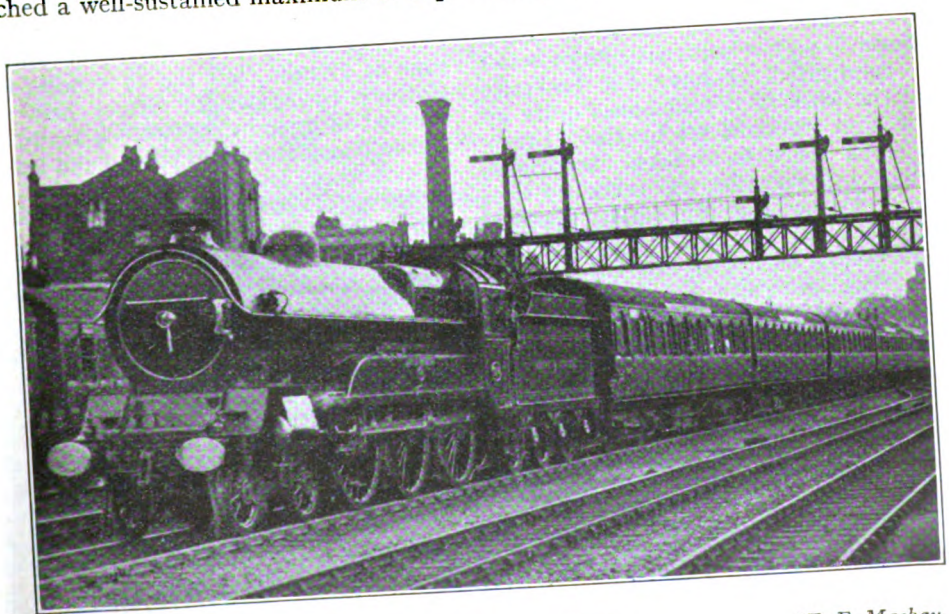

Photo.] GREAT CENTRAL RAILWAY. [*F. E. Mackay.*

Manchester Express leaving Marylebone. Four-cylinder 4-6-0 locomotive, No. 1167, "Lloyd George."

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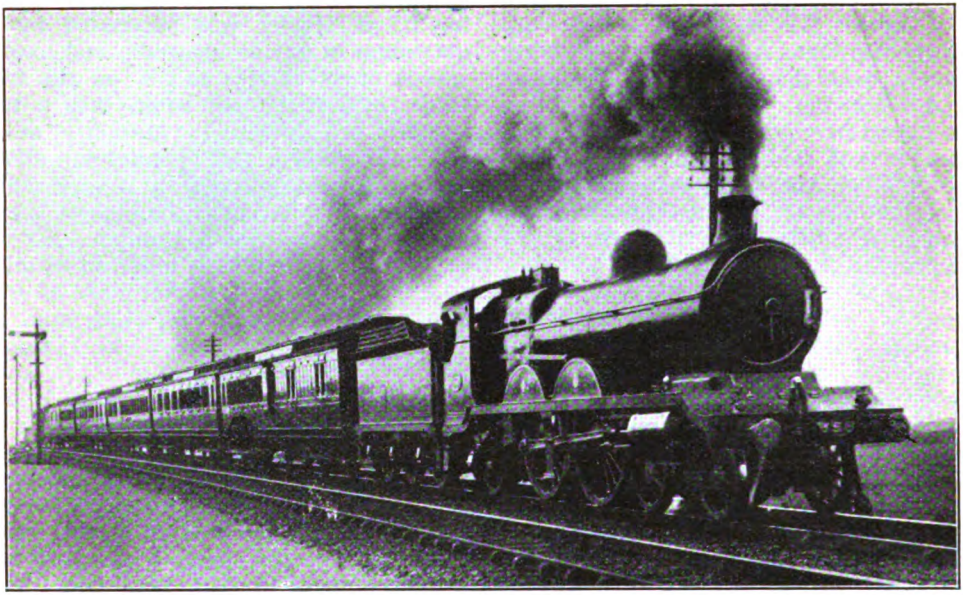

GREAT CENTRAL RAILWAY.

Through Newcastle-Swansea express (Great Western Railway coaches) near Leicester.
Hauled by 4-4-2 engine, No. 358.

From Leicester our load was more than double that of pre-war times (when a coach was slipped at Leicester), and to my surprise the engine provided to work us forward was No. 1027, one of the earlier Robinson 4-4-0's rebuilt with large boiler and superheated. I have not generally found the work of these engines quite up to the high standard set by the "Directors," but there have been exceptions, of which this occasion was certainly one. From Leicester the immediate start is favourable, but the next two miles are adverse, rising mostly at 1 in 176; nevertheless, we got away with wonderful smartness, passing Belgrave, 2·3 miles, in 4 min. 55 sec. Then, making the most of the subsequent favourable grades to Loughborough, where we reached 75 m.p.h., we passed Rothley, 5 miles, in 8 min. 25 sec.; Quorn, 7·8 miles, in 11 min. 5 sec., and Loughborough, 9·8 miles, in 12 min. 50 sec. Falling to 55½ m.p.h. up the 1¾ miles at 1 in 176 to Barnston Box, we reached 75 m.p.h. again on East Leake bank; Barnston, 12·8 miles, was passed in 15 min. 40 sec.; East Leake, 14·4 miles, in 17 min. 10 sec.; Ruddington, 19 miles, in 21 min. 10 sec.; and Arkwright Street, 22·5 miles, in 24 min. 20 sec. The usual very slow approach was made to Nottingham, Victoria, our start-to-stop time for the 23·4 miles from Leicester being 5 sec. over the allotted time of 27 min., but the 17·5 miles from Rothley to Arkwright Street had been covered in 15 min. 55 sec.—a really fine feat in consideration of engine and load.

Such heavy additions of passengers were made at Leicester and Nottingham—there were by now a very large number occupying all the corridors—that the gross load of the train from Nottingham was fully 325 tons. No small task, therefore, awaited the engine in facing the 11 miles' ascent to Kirkby Junction; this is inclined from the start at 1 in 130–132, practically without a break, save for short strips through each station, and 1¼ miles level and slightly downhill through Bulwell Common. Nevertheless we passed New Basford, 1·8 miles, in 5 min.; Bulwell Common, 3·3 miles, in 8 min. 10 sec.; Hucknall Town, 5·8 miles, in 11 min. 40 sec.; and Kirkby South Junction, 10·8 miles, in 20½ min., the sustained rate at the top of the ascent being exactly 30 m.p.h. The 3½ miles of broken but

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mainly favourable grades past Kirkby produced a maximum of 56½ m.p.h., and the 3¾-mile (2¼ at 1 in 132) bank to Pilsley, the summit, a minimum of 43½ m.p.h. Kirkby, 11·7 miles, was passed in 21 min. 50 sec.; Tibshelf, 16·5 miles, in 27 min. 40 sec.; and Pilsley, 17·9 miles, in 29½ min. Then followed a rather more rapid descent than customary to Staveley, with a top speed of 76½ m.p.h.; thus we were through Heath, 20·3 miles, in 32 min. 20 sec., and Staveley, where speed was sharply reduced, 26·2 miles, in 37 min. 35 sec. On the subsequent undulations the speed averaged about 60 m.p.h., Killamarsh, 30 miles, being passed in 41 min. 20 sec., and Woodhouse, 33·2 miles, in 45 min.; by slacking over Woodhouse Junction more severely than usual we took 7 min. 25 sec. for the remaining five miles over Darnall "hump" into Sheffield, and so exceeded the 52 min. schedule for the 38·2 miles from Nottingham by the small margin of 25 sec. But our driver had done thoroughly well, and had good cause to be satisfied with such excellent time-keeping. Over the remainder of the journey to Manchester behind compound "Atlantic" No 258, however, which succeeded in dropping more than 15 min. on schedule, I prefer to drop the veil of obscurity!

The only other run I have had of recent months in this direction was one on the 12.15 noon from Marylebone, but this was quite uneventful. To Leicester, indeed, it was poor, as "Atlantic" No. 264, with only six large eight-wheelers, lost 5 min., made up of small deficiencies on each section. The only decent piece of work was from Princes Risborough to Brackley, 27·8 miles, in 30 min. 10 sec., start-to-stop, Calvert, 17·3 miles, being passed in 17 min. 25 sec. No. 264, by the way, was working with No. 265's tender, and at Leicester we had the unique experience of exchanging for No. 265 with 264's tender! Then we did a little better, covering the 9·8 miles to Loughborough start-to-stop in 13 min. 20 sec., the 13·6 miles on to Nottingham in 16 min. 35 sec. (top speed, 69 m.p.h., at Ruddington), and the 38·2 miles from Nottingham to Sheffield in 49 min. 10 sec., passing Kirkby South Junction in the good time of 16 min. 10 sec., at a minimum of 43 m.p.h. But the full load was only 230 tons. At Sheffield it was increased to 270 tons, and 4-6-0 No. 425 *City of Manchester* ("Sir Sam Fay" class) did fairly well to cover the

LONDON & SOUTH WESTERN RAILWAY.

Waterloo–Exeter train passing Raynes Park. Rebuilt and superheated 4-4-0 locomotive, No. 430.

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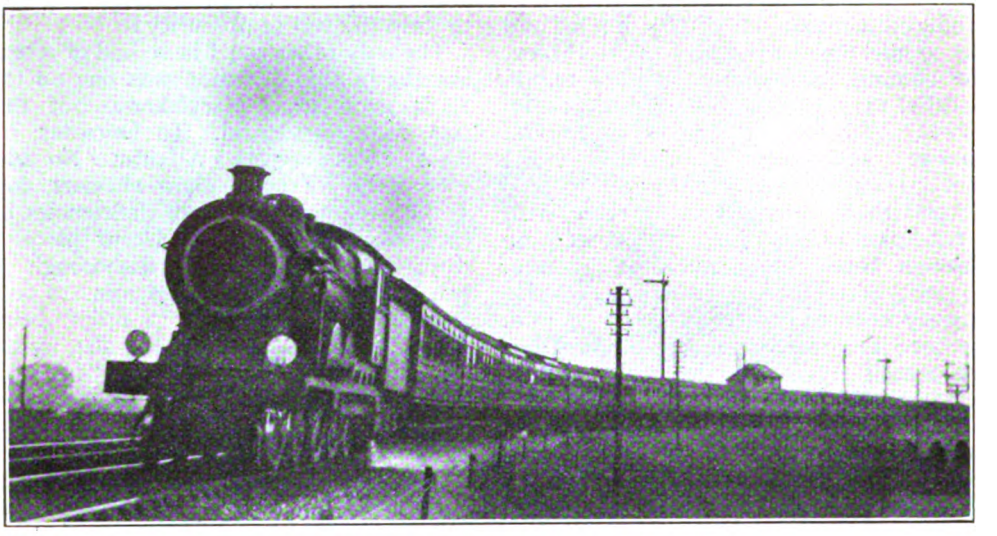

GREAT EASTERN RAILWAY.

London–Hunstanton express near Clapton. 4-6-0 locomotive, No. 1529.

12·9 miles of steep ascent to Penistone in 23 min. 35 sec., reaching all but 40 m.p.h. up a 1 in 130 grade. After that the only occurrence of note was a stop at Hadfield, which included drawing the train up twice, and yet was completed in a total of 55 sec. !

The run which interested me the most, however, was an up journey on the 8.20 a.m. out of London Road, Manchester, on which we were worked throughout by the four-cylinder 4-6-0 engine No. 1169, *Lord Faringdon*, this being the first occasion on which I have had the opportunity of recording the running of one of these fine machines. From Manchester the load consisted of eight bogie vehicles, mostly large stock, and weighing 263 tons empty and 280 tons full. We began by covering the five miles to Guide Bridge in 9½ min. ; on the 1 in 173 to Gorton speed rose to 43 m.p.h., but from there the grade steepens to 1 in 100-133, on which we fell to 40 m.p.h. The next 4·8 miles to Mottram, which we covered in 9¾ min., start-to-stop, are steeper ; they begin at 1 in 77·108-97, and continue at 1 in 185-143 to beyond Godley, on which easier length speed rose to 37½ m.p.h. Re-starting from Mottram we reached 37½ m.p.h. again on the short level strip over Dinting Viaduct, but fell to 30 on the 2½ miles at 1 in 100 past Hadfield ; on the subsequent 1 in 117 to Woodhead we recovered steadily to 34½ m.p.h. So we passed Dinting, 2·1 miles, in 5 min. 10 sec.; Crowden, 7·4 miles, in 15¼ min. ; Woodhead, 9·4 miles, in 18¾ min., and Dunford Bridge, 12·6 miles, in 24 min. 20 sec. Speed scarcely varied up the 1 in 201 through Woodhead Tunnel, but we touched 67 before Penistone, and completed the 18·6 miles from Mottram to Penistone in 31 min. 25 sec. From Guide Bridge, including a stop of 40 sec. at Mottram, we had taken 41 min. 50 sec., instead of 40 min. But by a smart run from Penistone down to Sheffield, whereby we covered the 12·9 miles in 15 min. 25 sec., start-to-stop (maximum speed was 65 m.p.h.), we recovered 1½ min. of the loss.

There was little of note about the running from Sheffield to Nottingham. We passed Woodhouse, 5·4 miles, in 8½ min., easing over Woodhouse Junction ; Staveley, 12 miles, was passed in 17 min ; Heath, 17·9 miles, in 26¾ min., and Pilsley summit, 20·3 miles, in 30 min. 35 sec., speed falling on the steepest part of the ascent—4 miles at 1 in 100—to 33 m.p.h. On the falling grades beyond Kirkby speed was not allowed to exceed 67 m.p.h. ; Kirkby South Junction, 27·1 miles, we passed in 38 min. 35 sec. ;

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Basford, 36·6 miles, in 47 min. 40 sec. and Nottingham, 38·2 miles, was reached in 50 min. 20 sec., booked 51 min. Here the addition of a fish-van and also a heavy complement of passengers brought our load up to 295 tons. We did not get above 56½ m.p.h. on the undulating 6½ miles from Nottingham, and took 6½ min. to Ruddington, 4·4 miles; falling to 48 m.p.h. up the four miles of East Leake bank (mostly 1 in 176) we passed Barnston Box, 10·6 miles, in 13 min. 35 sec., and Loughborough, 13·6 miles, in 16 min. 35 sec., at 67 m.p.h. Rothley, 18·4 miles, was breasted in 21 min. 35 sec., and Leicester, 23·4 miles, reached in 27½ min., ½ min. over schedule.

Leaving Leicester 3 min. behind time, we passed Whetstone, 4·7 miles, in 7 min. 35 sec., and Ashby, 9·2 miles, in 14 min., speed up the 6½ continuous miles at 1 in 176 varying from 41½ to 43 m.p.h. Lutterworth, 13·1 miles, was passed in 18 min. 55 sec., and with a subsequent maximum of 77½ m.p.h. we stopped at Rugby, 19·9 miles, in 25 min. 20 sec. (allowed 25 min. to clear). But good work was done between Rugby and Woodford, as we passed Braunston, 4·7 miles, in 6¼ min.—a very smart start this—went up the six unbroken miles at 1 in 176 to the London end of Catesby Tunnel without the rate falling below 43 m.p.h., breasted Charwelton, 11·7 miles, in 14 min. 50 sec., and reached Woodford, 14·1 miles, in 18 min. 25 sec. Nineteen minutes constitute the allowance, and it is a tight one in view of the ascent, especially when the load is as great as 300 tons.

At Woodford the load was made up to 325 tons (nine bogies and a four-wheeler, packed), and from here we covered the 9·8 undulating miles to Brackley in 13 min. 10 sec., start-to-stop, allowed 14 min. to clear. Then came a fast run to Aylesbury, as, despite slacking over Quainton Road Junction, we covered the 21·3 miles from Brackley in 23¼ min., start-to-stop, although allowed 24 min. We did not exceed 74 m.p.h. on the descents, and passed Finmere, 4·8 miles, in 7 min. 5 sec.; Grendon Junction, 12·5 miles, in 13¾ min., and Quainton Road Junction, 14·7 miles, in 16 min. 10 sec. From Aylesbury again we did really well uphill, the sustained speed up the 1 in 117 of Wendover bank, which continues for the bulk of the first seven miles out of Aylesbury, being 37½ m.p.h. So Wendover, 4·7 miles, was passed in 9½ min.; Missenden, 9·2 miles, in 15 min. 25 sec.; and Amersham, 14·4 miles, in 20 min. 40 sec., speed after Missenden

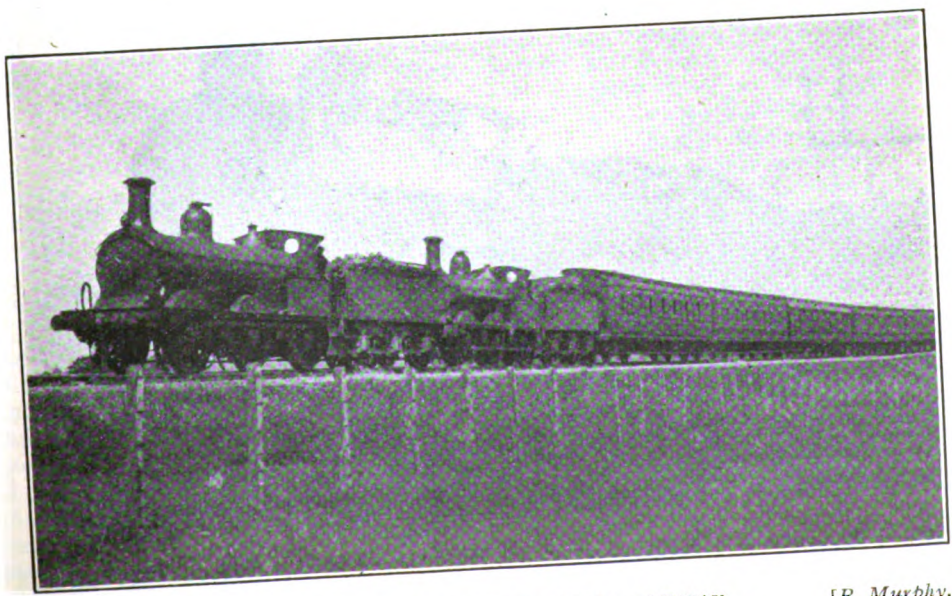

Photo.] SOMERSET AND DORSET JOINT RAILWAY. [*R. Murphy.*

Bath–Bournemouth restaurant car express near Chilcompton. 0-6-0 locomotives, Nos. 64 and 75.

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reaching 70½ m.p.h., and falling again before Amersham (up 2¼ miles at 1 in 160) to 50 exactly. Down the long descent to Rickmansworth we went cautiously, not exceeding 71 m.p.h.; Rickmansworth, 20·8 miles, was passed at reduced speed in 26 min. 55 sec. From there we ran to Harrow, eight miles of sharp undulations, in 9 min. 55 sec., and from Harrow into Marylebone, 9·8 miles, in 11 min. 35 sec., with a top speed of 65 m.p.h. at Wembley Park. So the 38 difficult miles from Aylesbury to Marylebone were covered, with this substantial load, in 48 min. 25 sec., or just within the 49 min. allowance.

As regards the running throughout from Manchester the driver adhered closely to booked times throughout, there being, as nearly as I could estimate, the trifling matter of ¾-min. gain to be credited to engine. But insufficient station allowances involved us in a late arrival at Marylebone by 8½ min. To tell the truth, I cannot help thinking that, satisfactory though the running was in itself, this deficit might have been recovered by the engine, had the driver been so minded, on the very showing of such exceptional effort as that displayed from Rugby to Woodford; the difference between the best work of the "Directors" on such a train, say, as the 7 p.m. into Marylebone and the running on this occasion was one hardly commensurate with the difference between the tractive power and weight of the two types. But it will not be long, doubtless, before I am afforded a truer estimate of the undoubted capabilities of the new four-cylinder engines.

AN EXCEPTIONAL LOAD ON THE LONDON & NORTH WESTERN RAILWAY.

Photo.] [*Leslie J. Thompson.*

SPECIAL TRAIN CONVEYING SIX ROTARY KILN SECTIONS FROM BARROW-IN-FURNESS TO POPLAR, SUNDAY, MAY 22, 1921.

The train is approaching Northampton (Castle) Station. 0-8-0 Superheater Locomotive No. 326.

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Photo.] [*Dawkes & Partridge, Wells.*

G.W.R. TUCKER STREET STATION, WELLS.
Looking towards Shepton Mallet.

The East Somerset Railway.

By W. E. EDWARDS.

THE present day description of the railway connecting the Cathedral City of Wells with the Great Western system at Witham Junction as the "East Somerset" branch implies, the reader need not be reminded, that the undertaking originated in private enterprise, such as was the case of numerous branches now absorbed in the various main line railways. Originally a single broad-gauge line extending over a distance of 13 miles 65 chains, the East Somerset was first publicly opened as far as Shepton Mallet on Friday, November 5, 1858, amidst great enthusiasm, for we learn that "a prodigious multitude awaited the arrival of the first train with a band of music when old *Homer* arrived with the directors, decked with flowers from stem to stern." That locomotive, it may be explained, was but a "four year old," of leading bogie, four-coupled, saddle-tank type, and the familiar reference noted indicated the then existent local interest by reason of the fact that the broad-gauge engines were as yet unnumbered, whilst each bore a distinctive, and in most cases, a very appropriate name, so when, during 1874, the new stud of standard gauge locomotives replaced them, and were distinguished by mere gilt numerals only, the writer's disappointment was shared by many others in the sections then affected. The actual number plates, it may be added, were not affixed for some considerable time. *Homer* continued at work until August, 1873, when a mishap terminated a career of well nigh two decades in the Bristol area.

The celebration in Shepton Mallet included a dinner at the George Hotel, Arthur C. Phipps, Esq., presiding, being supported by the following directors :—

J. M. Paget, J. G. Somerville, Edward Clarke, and T. S. Foxwell, Esqs., The Contractor, Mr. Brotherhood, was present, as also Mr. Ward, C.E., of the

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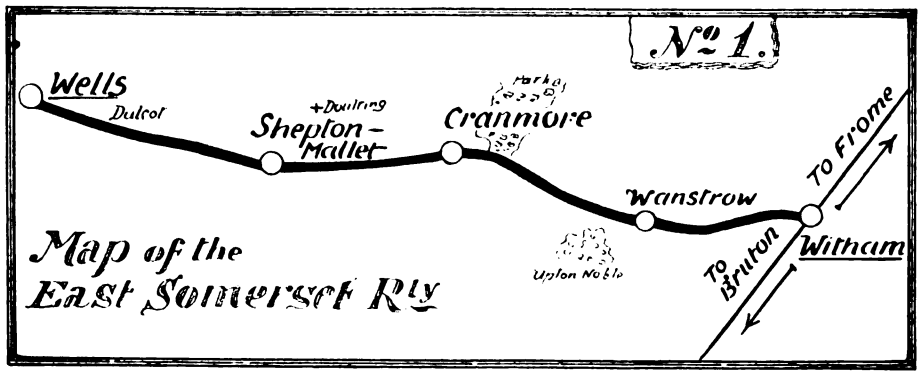
Great Western Railway, together with Mr. G. M. Mackay, Secretary to the East Somerset Railway.

There now ensued a delay of nearly four years ere the extension to Wells was publicly opened, and to which some opposition was offered on behalf of a competing broad-gauge line, the Somerset Central. But as the authorising Act required the completion of the said extension within a given limit, it was decided at a late hour, to fulfil that obligation. Accordingly, the next noteworthy event was that of the opening of the remaining five miles between Shepton Mallet and Wells, on February 28, 1862. In the latter city there was a procession from the new terminus to the Swan Hotel, headed by the Rifle Volunteer Band. Sixty guests were present, including the Mayor,



and the Recorder of Wells, the Marquis of Bath (an East Somerset director), as also Mr. J. G. Somerville, of the Great Western Railway. Referring to the accomplished extension, the Chairman remarked that "the directors had thought that the project (of reaching Wells) was hopeless, but Lord Bath had come forward and said 'You want £50,000 in order to do it, I will put down £25,000 of that amount.'" The regular passenger service was established on the following day, March 1, 1862, with a local service to Witham Friary as follows:—

6.55 a.m.
10.25 a.m.
1.45 p.m.
6.30 p.m.

Third-class passengers were conveyed at 10.25 a.m. only, arriving in London at 5.5 p.m., while those of first and second class by that train, reached Paddington at 3 p.m.

It may be interesting to note that the Board of Trade insisted upon the provision of an engine turn-table at Witham, "otherwise," it was decreed, "goods traffic would not be sanctioned." The appliance was provided, and still exists, but an undertaking is still enforced, so the writer believes, providing for the use of tank engines only upon the branch. Throughout the broad-gauge period, and for a considerable time afterwards, a "mixed" service was maintained, until other conditions, hereafter to be noted, obtained.

A long familiar personage of the East Somerset era, as indeed of the succeeding standard gauge *regime* also, was the late Guard Wall. That veteran railway servant was a resident of Vicar's Close, Wells, and as such, was accorded, ultimately, the privilege of burial under Cathedral auspices, a distinction probably unique in railway annals.

Proceeding downward from Witham, formerly known, the reader will have observed, as "Witham Friary," the train starts on a rising gradient, which condition allows of the practice of shunting the empty passenger vehicles up the incline, they then being allowed, in charge of a competent man, to gravitate into the bay platform line, the movement being regulated by the fixed signals, and so allowing the engine to back on to the starting position. This incline continues to Wanstrow (2 miles, 26 chains), the gradient being as steep as 1 in 47 at one point. Wanstrow station consists of a

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single short platform provided neither with signals nor station staff, while in older days, no train called at Wanstrow unless intending passengers were actually upon the platform, as then directed by public notice. Passengers joining trains thereat are excessed at Witham, Cranmore, or other East Somerset stations, while in the case of parcels or milk traffic, the consignment notes are taken to one or other of the adjoining stations, the guard being responsible in either case. The rising gradient continues to Cranmore at 1 in 54 at steepest, broken by a fall of 30 chains only, Cranmore being a crossing

Shepton Mallet is again a crossing and electric staff station, and the existence of a public level-crossing thereat, combined with the gradient noted, involves special precautions as to shunting, or other movements. Before Wells is reached, a bank of nearly 3¼ miles is descended, the fall, in one case, being as much as 1 in 46, and saving a rise of some 35 chains in the reverse order, with lesser undulations, the declivity is virtually a 4½-mile one. Accordingly, a stop-board is placed some ¾-miles below Shepton.

A familiar feature, two miles outside Wells, is Dulcot Hill, near which are the

Photo.] [*Dawkes & Partridge, Wells.*

SOMERSET AND DORSET JOINT RAILWAY STATION, WELLS.

Looking towards Shepton Mallet. G.W.R. (East Somerset) signal box in background.

and electric staff station, 5 miles, 57 chains, distant from Witham. At a further mile's distance is situated Doulting Siding, so known by reason of the well-known stone quarries bearing that name. The siding is approached in both directions from the single main line, the points being controlled by the key attached to the electrical train staff. Doulting is the summit point of two inclines, and special regulations apply to the siding working. As noted, a fall in the opposite direction is experienced from this point, starting at 1 in 56, but easing down to 1 in 92, at Shepton Mallet.

stone quarries so named. They are accommodated with a siding, approached from the single main line in the Up direction, the points are operated as in the case of Doulting, afore-mentioned, and the situation is upon a steep gradient.

Blasting operations are there permitted, within specified times, but the firing of shots is allowed only when an appointed railwayman has arrived from Wells, carrying the "blasting disc," and provided also with the electrical train staff for the purpose of closing the line.

On approaching Wells, the old "East Somerset yard," as still described, is

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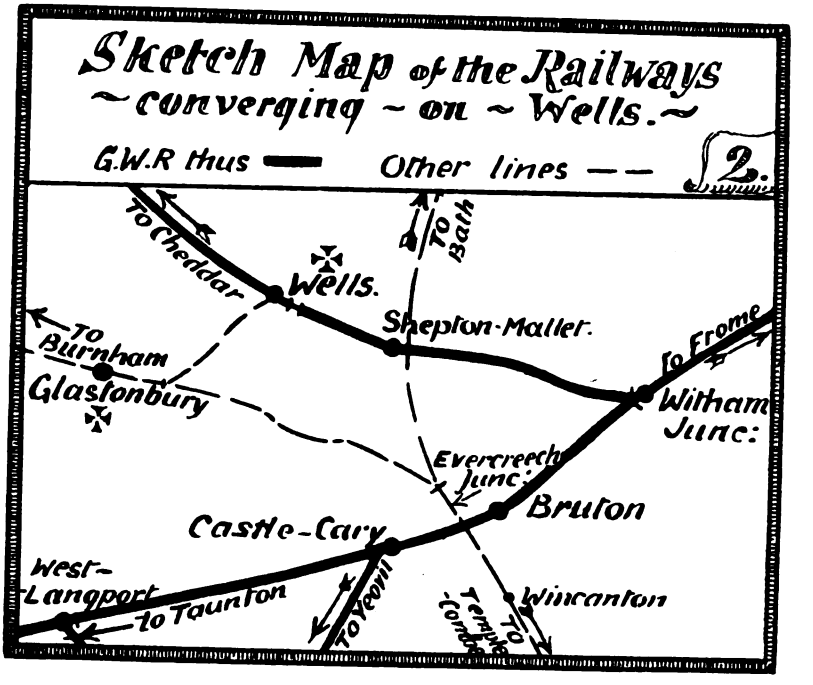

entered, upon the up side of which the original terminal passenger station may be yet traced. Next the Somerset and Dorset yard is passed through, including the passenger station of that company, although no description of traffic is there dealt with by the Great Western Railway; nine chains of the Somerset and Dorset Joint line are thus traversed. The former Bristol and Exeter Railway territory is then entered, including the original terminus in Tucker Street, now used for all Great Western Railway passenger traffic, but still locally known as the "Cheddar Valley Station." Further downwards may be noted the sidings forming the original Bristol and Exeter Railway goods yard.

Interchange of goods traffic is effected by means of a service of transfer trips daily.

Railway communication with Wells was first provided (in the spring of the year 1859), by the Somerset and Dorset, or rather the Somerset Central Railway, a broad-gauge line afterwards merged in the first noted joint railway. Two years later, the gauge was "mixed," and finally the broad-gauge disappeared with the amalgamation with the narrow-gauge Dorset Central Railway, about 1862. Then followed the afore-mentioned opening of the completed East Somerset Railway, also in 1862, A third railway, again broad-gauge, next made its *debut*, being the extension of the Bristol and Exeter line via Yatton and the Cheddar Valley, in the year 1870, with the present Tucker Street Station as its terminus, and, with a view to the future, the rails were laid on the transverse system. At that period, therefore, Wells possessed three terminal stations, each separately owned, the two broad-gauge lines being entirely unconnected owing to the intervening standard-gauge rails of the Somerset and Dorset Company.

Next came the conversion, in June, 1874, of the East Somerset Railway, together with the remainder of the Wilts and Somerset section of the Great Western Railway, while during the year following, the Cheddar Valley branch shared the same fate at the hands of the Bristol and Exeter Company.

Some three years later, the East Somerset terminus was closed, and Tucker Street became a through station, approached as noticed, via the Somerset and Dorset Joint Railway. The former local East Somerset service gave place, (though not entirely), to through workings between Witham, Wells, and Yatton, in

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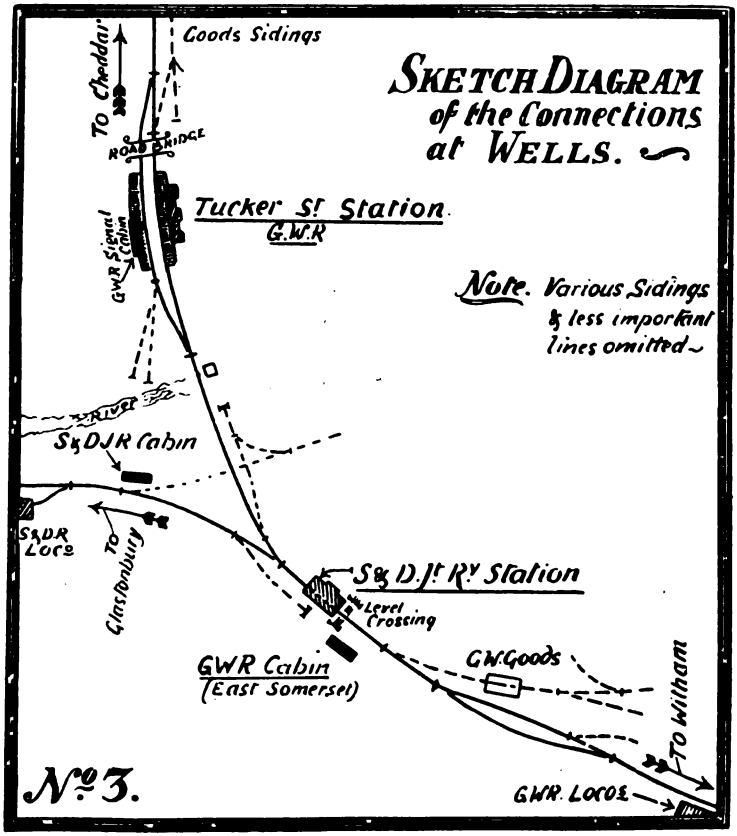
some cases extended to Bristol; while similar services to Bristol were later inaugurated via Frome, Radstock or Trowbridge—hence, in fact, the possibility of a "Wells to Wells" service, via the alternative routes indicated.

Sketch diagram 3 indicates the junction arrangements at Wells, a public level-crossing existing, as shown, on the Shepton Mallet side of the Somerset and Dorset joint station; the gates are controlled from the adjacent "East Somerset" cabin of the Great Western Railway. That Box is in communication with the Somerset and Dorset joint cabin, and certain signals are jointly controlled, while a third cabin exists upon the Tucker Street platform as indicated. That station is now available for crossing passenger trains, and another crossing-loop, of older origin, is provided within the East Somerset yard, available for two goods, or one goods and a passenger train.

Upon the establishment of the through working noticed, a whistle code was devised, according to which the Great Western Railway trains are announced by a triple signal before passing over the Somerset and Dorset joint line, while two whistles are sounded in the case of that company's trains.

Upon the Cheddar Valley section the crossing and staff stations are Wookey, Lodge Hill, Cheddar, Axbridge, Sandford and Congresbury, but two passenger trains may be crossed only at Cheddar, Axbridge, or Congresbury. A gradient of 1 in 75 is the steepest of the section, that being between Axbridge and Winscombe.

From the down side of the line at Witham Junction we are confronted with a fine view of Stourton Tower, some 150 ft. in height, and itself standing upon an eminence of 800 ft. Cranmore Park will next be noticed on our right, and, travelling over high ground, Cranmore Tower is



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passed under, a landmark over 900 ft. high. Doulting Village and Church are also adjacent to the railway, including the aforementioned quarries of Oolite, of which stone Wells Cathedral is constructed, and next, after intersecting the Somerset and Dorset Joint Railway, Shepton Mallet, the chief East Somerset station, is reached. The town lies in a valley south of the Mendips, and the railway follows in the course of the Sheppey through charming woodland valleys into Wells, where, long before the latter is reached, Glastonbury Tor is viewed on the left, while upon our right is revealed the old world Cathedral City, dominated, at least architecturally, by the mother church of the Diocese. The noble tower of St. Cuthbert's will scarcely fail to attract our attention also.

Of the Cheddar Valley section, it suffices to add that the line has been described as "the prettiest railway in Somerset." The scenery is ever changing in character, consisting largely of wooded valleys set off by the heights of the Mendips which skirt the course of the line, nor should a constant succession of picturesque villages, with their church towers of the typical Somerset type, be omitted from a veritable panorama which culminates in the singular beauty of the Cheddar Cliffs.

From the foregoing, the reader will have doubtless gathered that the East Somerset, together with the Cheddar Valley Railway, now form integral parts of the Great Western system.

It may be interesting to add that a down train from Witham becomes an "up," when proceeding beyond Wells in the Yatton direction, and *vice versa*.

A PICTURESQUE SCENE ON THE LONDON, BRIGHTON & SOUTH COAST RAILWAY.

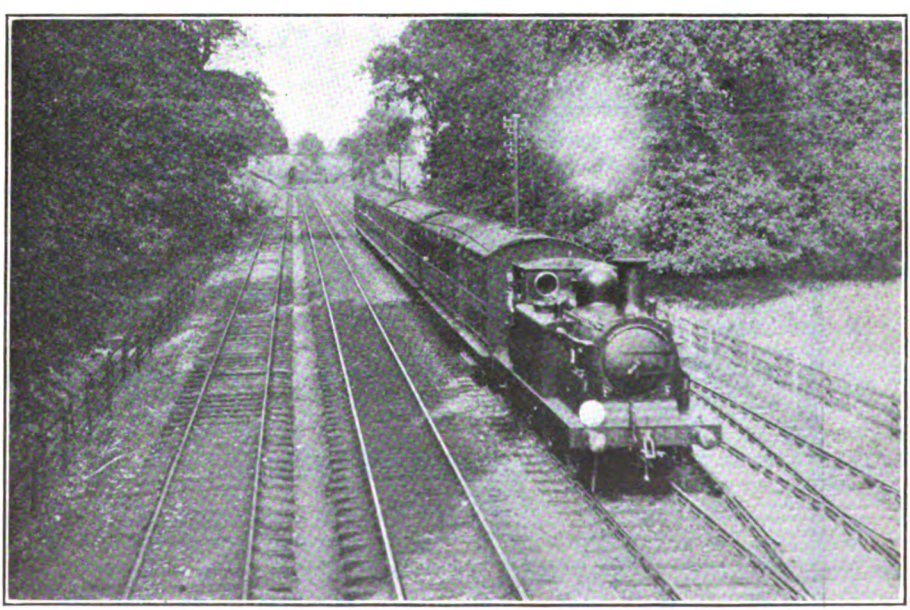

Photo.] [*C. J. Housego.*

LONDON BRIDGE-DORKING TRAIN NEAR EPSOM, HAULED BY 0-4-2 LOCOMOTIVE, No. 248.

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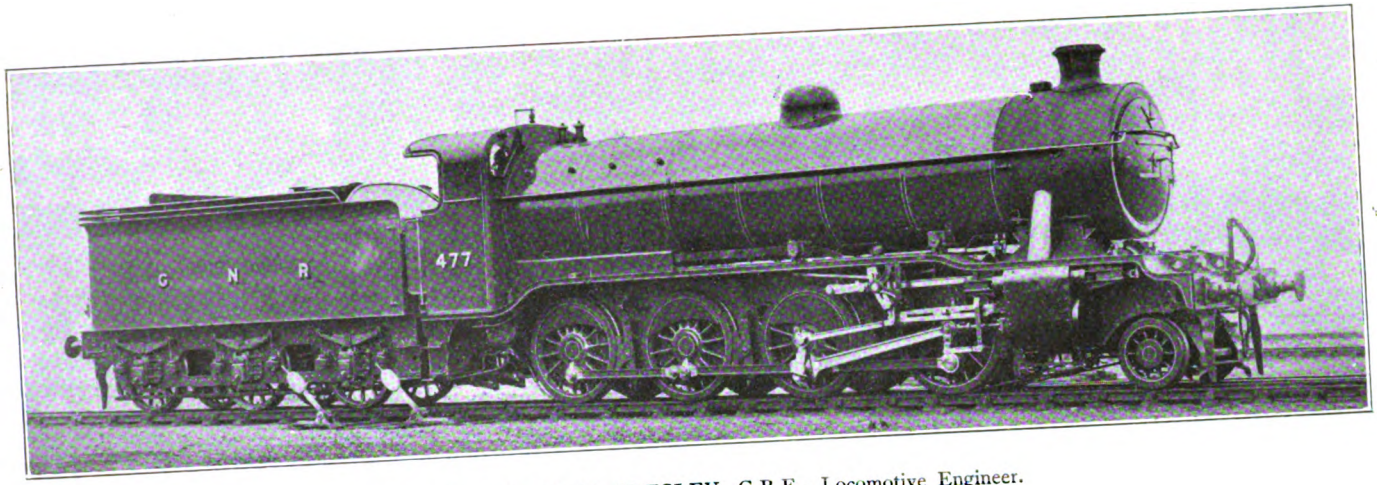
NEW THREE-CYLINDER 2-8-0 MINERAL LOCOMOTIVE No. 477, GREAT NORTHERN RAILWAY.



Designed by Mr. H. N. GRESLEY, C.B.E., Locomotive Engineer.

GENERALLY corresponding with the original three-cylinder mineral engine No. 461 (see RAILWAY MAGAZINE July, 1918), No. 477 has the outside cylinders almost horizontal, with the three steam chests in line above the outside cylinders and at the side of the inside cylinder. The cylinders are also enlarged from 18 to 18½ in. diam., as in the case of the three-cylinder 2-6-0 engines of the "1000" class. Wheelbase is increased from 26 ft. 4 in. to 27 ft. 2 in. Heating surface is modified from 2,521 sq. ft. to 2,462·5 sq. ft., the change relating to the tube surface. Steam pressure is raised from 170 to 180 lb. per sq. in. Weight in working order (engine only) is 75 tons 16 cwt., as compared with 76 tons 8 cwt. Ross safety valves and Wakefield mechanical lubricators are fitted.

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The Largest Goods Depôt in South Africa.

KAZERNE goods depôt, Johannesburg, when taken over by the South African Government Railways on the union of the various systems, consisted of an emplacement bounded on the east by Harrison and Diagonal Streets, on the north by the railway line between Park and Braamfontein Stations, and on the south by Bree and President Streets, excepting the police barracks at the corner of Harrison and Bree Streets, and the adjoining customs house, now serving as offices for the Goods Superintendent's staff, the ground south of Bree Street having subsequently been acquired by the Johannesburg municipality. The yards at that time were graced by five sheds and a row of wood and iron offices, abutting on Bree Street. There were also 5½ miles of length of rail at the disposal of the N.Z.A.S.M. (the Netherlands South African Railway Company) at this depôt at the inception of the Anglo-Boer War. An open stormwater sluit ran along Bree Street to President Street, and during heavy rainstorms presented a veritable raging torrent. A public thoroughfare ran through Kazerne to Braamfontein, crossing the railway line at De Beer Street. Sheds Nos. 6 and 7 were erected shortly after the Boer War. At present a new shed is in course of construction along the Harrison Street end of the premises, and a double-storey building of substantial dimensions is on the point of being erected in the place of the old dilapidated structure of green brick at the corner of Harrison and Bree Streets.

According to the *South African Railway and Harbour Magazine*, from which we quote, this has been found absolutely necessary owing to the stupendous increase in the traffic dealt with at Kazerne during the past few years, the present shedding accommodation having not only proved to be inadequate to cope therewith, but it having also been found necessary to provide a building of modern design capable of adequately quartering the Goods Superintendent and staff. At the end of January, 1920, the staff employed at Kazerne totalled 921, not taking into account those employed in the cartage services. The classification of this personnel is as follows :—Clerical staff, 194 ; checkers, 104 ; inspectors, 5 ; shunters, 59 ; police, 80 (28 of these being natives) ; messengers, 31 ; yards staff, 42 (29 of these being white labourers) ; natives, 406.

With the opening of the new market and warehouse block sidings at Newtown, having a rail system of 9 miles, a considerable amount of traffic was diverted thither from the Kazerne yards, but the rapid commercial growth of Johannesburg soon replaced it, with the result that there is great difficulty at times in coping with the flow of traffic, especially outwards, which a little more than doubled itself during the course of the Great War. Gross annual tonnage, both inwards and outwards, handled at Kazerne has increased enormously, having risen from 538,851 tons handled in 1916, to 1,254,474 tons in 1919, the latter amount being constituted as follows :—Inward traffic 935,661 tons and outward traffic 318,813 tons. The average number of outward consignments dealt with daily at this depôt gradually advanced from 1,300 in January, 1912, to approximately 3,000 per day forwarded during January, 1920, the inward consignments for the last few months totalling 40,000 on an average per month.

Braamfontein is the main line depôt for receiving traffic for Kazerne and Newtown. Its total mileage is 5 miles main line and 17½ miles siding rails, making a total of 22½ miles for Braamfontein Station and yards. Coal and live-stock are separated there and placed in exchange sidings convenient to Newtown. All other goods traffic is passed out to Kazerne, two engines being used continuously for this purpose, and one extra in the afternoon, Newtown traffic necessitating two locomotives at a stretch as well, one extra engine being used at the market in the forenoon. A staff of four number takers is kept busy at Kazerne in going over all trucks arriving at that depôt, it being their duty to endorse on the trucks' sides in chalk the point at which off-loading is to be performed. They have also to submit

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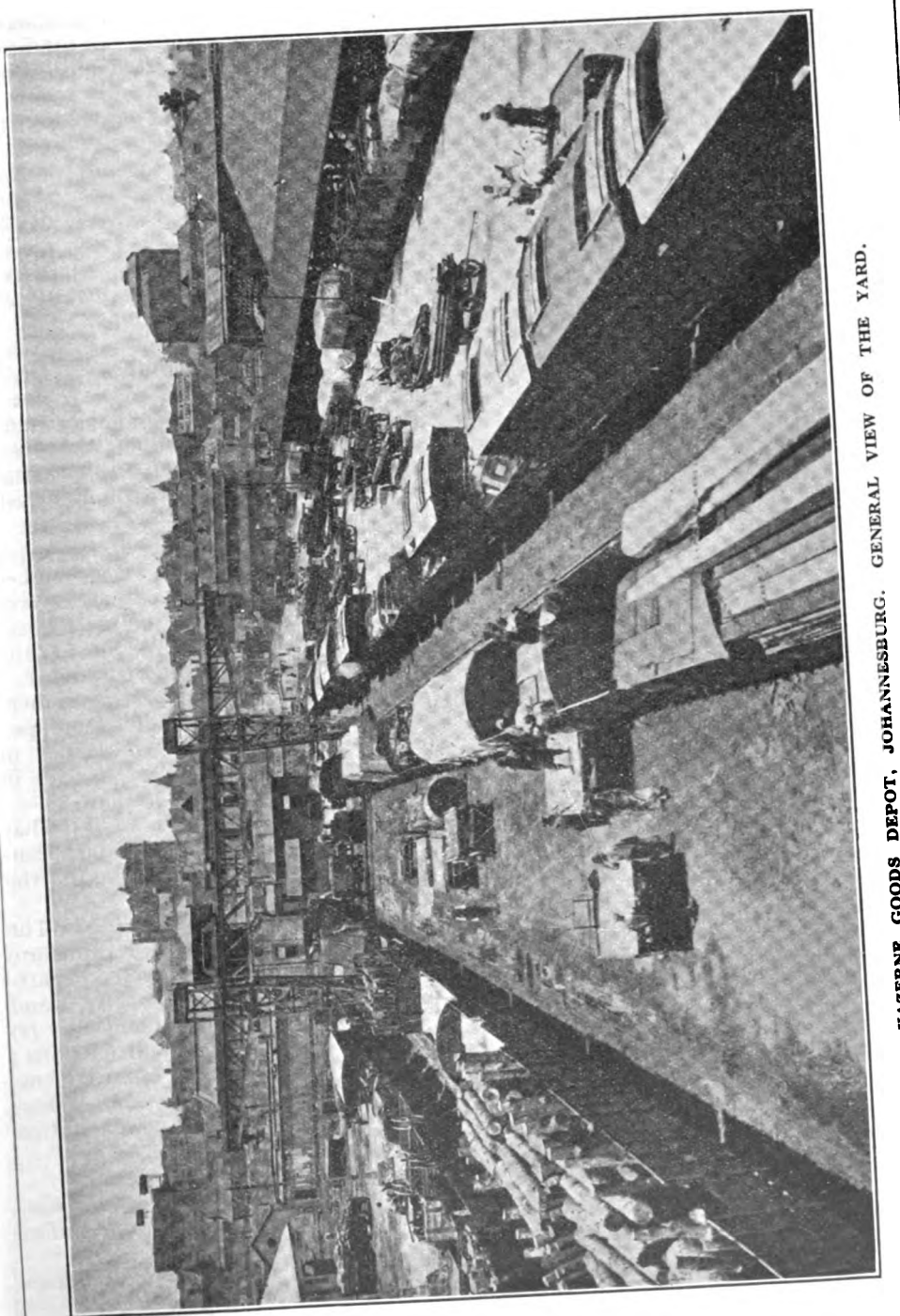

KAZERNE GOODS DEPOT, JOHANNESBURG. GENERAL VIEW OF THE YARD.

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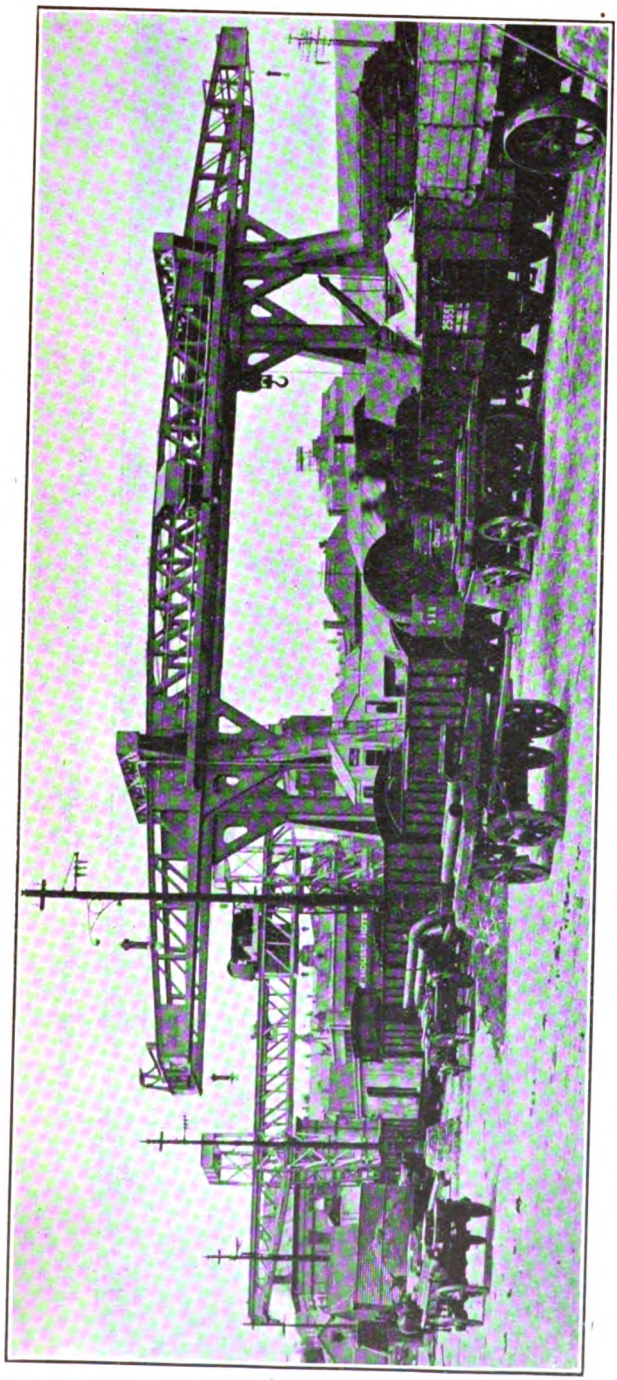

35-TON ELECTRIC CRANE FOR GENERAL YARD WORK.

a rolling-stock return every morning specifying thereon the following particulars :— Truck number, classification, forwarding station, consignee, contents, position, date of dispatch, and date of arrival ; this form, T 243, being required for agenda besides other purposes.

Trucks on arrival in Kazerne stock yard, the present railage system of which is a 9¼-mile one, are sorted out as follows :—

(1) *Traffic for sheds.*—Perishable town delivery goods are passed on to sheds Nos. 3 and 4, all other mixed traffic for sorting out in sheds and not of a perishable nature being dealt with by sheds Nos. 5 and 6, shed No. 7 being used as excess depôt and tarpaulin shed. (Shed No. 8 at present under construction, will be used alongside with sheds Nos. 1 and 2 for forwarding purposes.)

(2) *Traffic for cranes*, there being two splendidly-equipped travelling electric cranes of 35 tons hauling capacity in service at this station.

(3) *Traffic for yards* : That is all rough goods which cannot be dealt with in the sheds.

(4) *Traffic for sidings* : The sidings served by Kazerne are those for the cartage department, Texas Company, Rand Cold Storage Company (*a*) meat, (*b*) coal, and (*c*) skins ; Angherns Cold Storage Company, Fleming's Mill, Transvaal Mill, the power station and gas works.

(5) *Traffic for weighing.*

(6) *Traffic for Newtown market* : That is perishable traffic, forage and grain.

(7) *Traffic for block-sidings leased by private firms.*

As already pointed out, coal and livestock are sent direct to the Newtown coal

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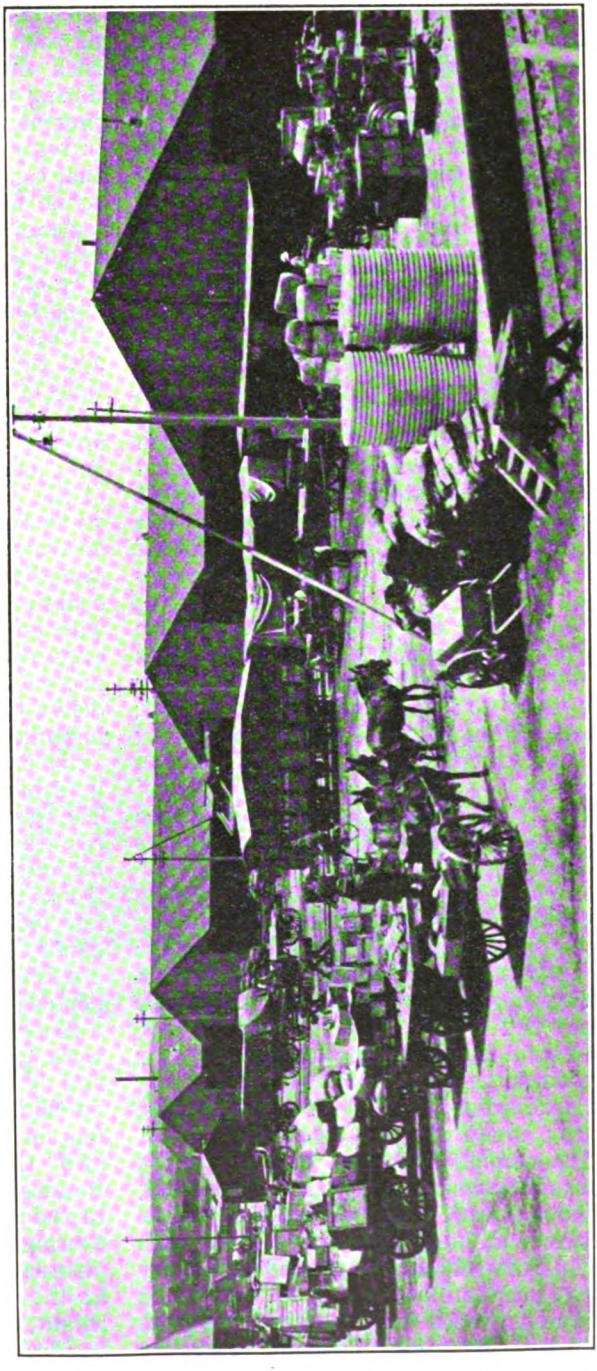
yards and live-stock market respectively from Braamfontein. There are at present 20 firms holding sites at the Newtown coal yards.

Great difficulty is at times experienced by the number takers in properly distributing the trucks as they come in, owing to lack of necessary information on truck labels. Thus trucks are frequently labelled "Various" when they contain heavy consignments requiring the use of cranes. Considerable delays to rolling-stock occur at times owing to the sending station not taking reasonable care in labelling the trucks properly, consignments being, for instance, addressed "Newtown," when their proper destination is Kazerne, delivery being only made to the former station in the case of private siding and market traffic. (At the end of January, 1920, there were 45 private sidings at Newtown.) It will, therefore, be appreciated that it is only after considerable delays and unnecessary cross haulage that such incorrectly addressed consignments reach their proper destination. Rough goods are not infrequently directed to the sheds through being labelled "Various," whereas their release would have been expedited if they had been sent to the yard direct. Market consignments are also very often mixed with Kazerne goods and trucks containing heavy machinery and motor cars in cases labelled "Various." In addition, further delays occur as the result of the sending station failing to forward invoices promptly. This applies particularly to Lourenço Marques, Point (Durban) and Port Elizabeth.

When the system is considered in its entirety it will



A BUSY CORNER OF THE YARD.

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be seen how vital it is, in order to effect delivery, release rolling-stock as soon as possible and avoid congestion, that invoices be at hand on arrival of trucks, as the same have to be checked by rates clerks, entered up by the agenda office, arrival notified and delivery papers made out, these having to be typewritten, sorted out in truck order and written off agenda books as traffic arrives, before being passed on to the various off-loading points. The eight hours working day now in vogue would also appear to affect the delivery of traffic to no mean extent. Previous to the institution of the eight hours day consignments were accepted by local firms as early as six o'clock in the morning.

The average daily truckage into Kazerne, excepting Sundays, during the month of August, 1919, was as follows :—General goods, 180 ; live-stock, 150 ; early market 60 ; Newtown coal yards, 60 ; Newtown general goods, 80 ; making a total of 530 trucks inwards on an average per day.

The average daily outward truck traffic during the same month from Kazerne was as follows :—Kazerne general goods, 152 ; live-stock, 40 ; early market empties, 12 ; Kazerne sidings, 12 ; Newtown sidings, 35 ; totalling 251 trucks outward daily on an average.

The truckage for Kazerne yards for the 12 months ended January, 1920, was as follows :—

Inwards :

General merchandise, 54,423 ; live-stock, 38,522 ; morning market, 16,973 ; Newtown coal yards, 14,029 ; block sidings, 1,783 ; gross total, 141,785 trucks.

Outwards :

General merchandise Kazerne, 39,550 ; live-stock, 10,603 ; morning market, 3,010 ; Kazerne sidings, 3,888 ; Newtown sidings, 7,524 ; totalling 64,575 trucks.

The combined figures, that is 141,785 trucks inwards and 64,757 trucks outwards, make a grand total of 206,360 trucks received at and despatched from this depôt during the 12 months ended January last. Incidentally it may be mentioned that amongst others three trains of empties are despatched to Witbank regularly every day, sufficient trucks being retained to meet general requirements.

The greatest developments have taken place at Newtown, at one time a plague spot, now covered with market buildings, private sidings, live-stock and coal yards. In fact, those responsible for the lay-out of Newtown could hardly have anticipated such rapid strides as have been made during the last few years. There is at present such lack of room for expansion in regard to market and live-stock traffic that considerable sums of money will have to be forthcoming in the near future if matters are to be put on a proper footing as far as these departments are concerned. " Safety-first " exponents will find ample opportunities of devoting their energies with good results to the Kazerne, Newtown and Braamfontein depôts, their ramifications of rail systems totalling no less than 40¾ miles for the comparatively small area they take up. There are, for example, only four sidings for detraining live-stock at the Newtown sale yards, each being of 15-truck content, thus making a total of 60 trucks, which can be dealt with at the same time, whereas as many as 300 trucks containing live-stock have had to be dealt with on one single day at this end. Not only does the present state of affairs necessitate serious delays in effecting delivery, but as consignees are not infrequently slow in taking delivery, animals very often have to undergo undue hardships before landing on terra firma. The system would at any rate appear to require thorough overhauling. It may be interesting to note that all cattle trucks are cleaned and thoroughly disinfected before being allowed to leave this depôt on the outward journey, about 250 being thus dealt with on an average per day.

A considerable saving in shunting work and quicker delivery of perishable and block-siding traffic would evidently be effected if the goods yard staff at Braamfontein were to separate that traffic there into the Newtown exchange sidings. Besides, the delivery of perishable traffic to the market in the morning, instead of overnight, would ostensibly require adjustment. As at present delivery is made at the time when the market is at its height, thus causing no little inconvenience, besides very often resulting in perishable traffic having to be held over till the next day, and that many times to its detriment.

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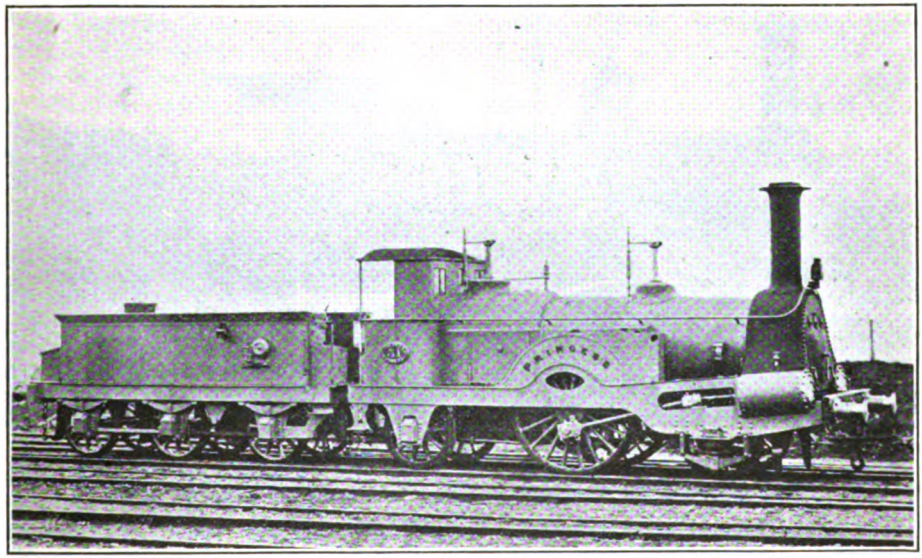
Locomotive and Train Working in the latter part of the 19th Century.

THE HIGHLAND RAILWAY. [No. I.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

UNTIL 1898, when the direct line from Aviemore to Inverness was opened, the Highland Railway possessed a main line from Stanley Junction, 7¼ miles north of Perth, to Wick, which was practically equal in length to the London and North Western main line between Euston and Carlisle; and, if the distance be calculated from Perth station, the starting point of the Highland Company's trains, it was six miles longer, for the mileage from Perth to Wick, via the old road, was 305 miles. The opening of the short cut between Aviemore and Inverness shortened this by 25¾ miles, so that the length of the present main line is 279¼ miles. The first section of the Highland line, which was opened in 1855, between Inverness and Nairn, now forms no part of the main line. But the 305 miles of main line formed an entirely different proposition to tackle as regards working than were the 299 miles between London and Carlisle, for the whole was practically all single line, with passing stations few and far between. The working of a long single line involves rigid punctuality if the proper crossing points and times are to be maintained, and if punctuality be not kept, it does not take long to produce chaos of a high-class brand.



2-2-2 PASSENGER ENGINE No. 31, "PRINCESS."

Built by Neilson & Co., 1863. Driving wheels, 6 ft. diam. Cylinders, 17 in. by 22 in.

The troubles of the Highland Railway in this respect were not alleviated by the fact that the departure to schedule time of their important trains from Perth was dependent upon the punctual arrivals of Caledonian and North British trains from the South. The Caledonian trains, as a rule, kept very fair time, but the North

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British trains, which in those days travelled via Larbert, and thence over the Caledonian line, were very great sinners. At the other end of the Highland line the arrivals of the fishing fleet were an "unknown quantity," and naturally the fish trains had to be worked as specials, so that a schedule of crossing places had suddenly to be telegraphed up the line to arrange for their safe working.

Then again the Highland, more than any other railway, depended for the greater part of its traffic upon the shooting season. For about three weeks from the last week of July, there was more northbound traffic than the company could very well manage, and about four to six weeks later, this traffic was streaming back again southwards. The result was that early in August there was a glut of empty coaches, saloons and horse-boxes, collected at Inverness and other stations north of that point, and these had to be worked back empty. Similarly in September, there was a landslide of rolling-stock southwards which ultimated in the blocking up of the sidings at Perth, and many of these vehicles had, somehow, to be got back to Inverness. No wonder that the staff got into an utterly bewildered condition, after which the railway hibernated, more or less, for the rest of the year.

Further, the gradients of the line made the working expensive and difficult. From Perth to the summit near Dalnaspidal, 1,484 ft. above sea level, the highest point of any main line railway in Britain, the banks rise in long stretches of 1 in 70 to 1 in 85, most of which occur between Blair Atholl (35 miles), and the summit (53 miles). On the north side of the summit there is an almost equally severe fall for 16 miles to Newtonmore. From Aviemore by the old line, which was the only one then in existence, there is another summit to be crossed at a height of 1,050 ft. near Dava, the rise from near Grantown to Dava being nine miles mostly at 1 in 80 to 1 in 84, followed by a long and steep fall of more than 17 miles to Forres, nearly all at 1 in 70 to 1 in 75. The 25 miles from Forres to Inverness are mostly comparatively easy.

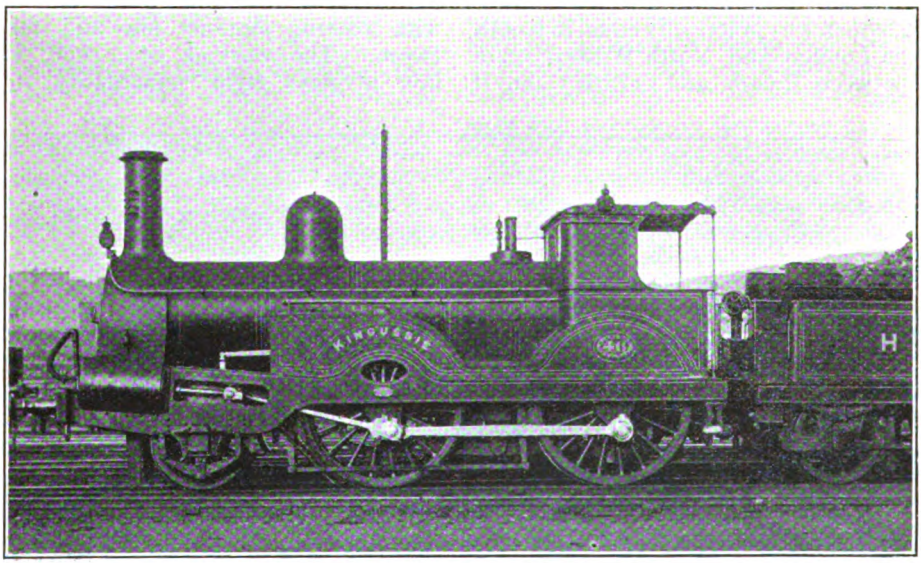

Photo.] [*Loco. Publishing Co., Ltd.*

2-4-0 PASSENGER ENGINE No. 46, "KINGUSSIE" (SERIES 46-55).

Built by Neilson & Co., 1864. Rebuilt 1896. Coupled wheels, 6ft. diam. Cylinders, 17 in. by 24 in.

As the Aviemore-Inverness direct line was not opened until nearly the end of the century, it need not be considered at this stage.

One is so accustomed to look upon the Highland Railway as a south to north line, that it is sometimes forgotten that

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the company also has a long east to west route, starting from Keith, and ending at Kyle of Lochalsh on the west coast opposite to the Isle of Skye, a total distance of 137 miles. Of this distance, at the present time 18½ miles of the main line are traversed, namely the section from Inverness to Dingwall, but before 1898, the 24¾ miles from Forres to Inverness had to be added to the length of main line passed over in the journey from east to west. The whole journey had, however, to be made in sections, with changes at Inverness and Dingwall, and possibly at Elgin as well, since there was no through service.

When considering the eastern portion of the Highland system, which was completed between Inverness and Keith in 1858, and then known as the Inverness and Aberdeen Junction Railway, it must not be forgotten that this is the oldest portion. All southbound traffic from Inverness and northwards originally went via Aberdeen, after being handed over to the Great North of Scotland Railway. The latter company thought a good deal of its own importance, (though to be candid it was a very shocking line in those days), for it controlled all traffic to the south. Its self-esteem grew so blatant that, like the naughty little boy in the story, it began to be very rude to its neighbours. Amongst the neighbours whom it offended were the gentlemen who directed the proceedings of the Highland Railway. Aberdeen was then a very inconvenient place from a railway point of view, for the Inverness passengers had to disembark at the Great North (Waterloo) Station at one end of the town, and transfer themselves across the town to Guild Street station belonging to the Scottish North Eastern Railway, whence they could travel to Perth. This was uncomfortable enough, but the Great North made it worse. Whenever they could possibly do so they started their trains going northwards from Aberdeen about a minute or two before the passengers for Inverness could possibly cross the town to catch them. The result was that the Highland people decided to make their own line to Perth. This left the original line at Forres and was opened in 1863, under the title of the Inverness and Perth Junction Railway. From 1865, the combined lines took the title of the Highland Railway, but although the lines north of Inverness had been opened in sections from 1864 onwards by various companies, it was not until 1874 that a complete through journey to Wick was possible.

For many years, partly as a result of the direct Perth line, there was a deep feud between the Great North of Scotland and the Highland railways, which may be compared with that which used to exist between the South Eastern and the London, Chatham and Dover companies. But in the case of the two English railways there was certainly the keenest competition between them at every important place served by both of them, whereas the competition between the two Scottish lines was of a comparatively mild nature, and was confined principally to southern traffic to and from Elgin and Keith. It was stated that once upon a time, in the very beginning of railways in this part of Scotland, the two companies tried to get on together, and held an odd board meeting or two at which representatives of both lines were present, but that ten minutes or so after the start matters had reached a point which may best be described in the words of Bret Harte (adapted) :—

"Then, McTavish, of Cromarty, raised a point of order when
A chunk of Scottish granite hit him in the abdomen,
He smiled a sickly sort of smile, and curled up on the floor,
And the subsequent proceedings interested him no more."

But the vagaries of the old Great North are not part of this story, and may be left until another time.

The line from Inverness to Wick does not require any detailed description, since no fast trains ran over it, except a few that worked between Inverness and Dingwall, 18½ miles away. North of Dingwall the passenger traffic becomes very meagre. The line, as far as Bonar Bridge, is comparatively easy, but the gradients become more severe further north, especially beyond Golspie, and banks of 1 in 100, 1 in 70, and 1 in 60 (the ruling gradient) are fairly frequent. The long western branch from Dingwall to Stromeferry, known as the "Skye Line," was

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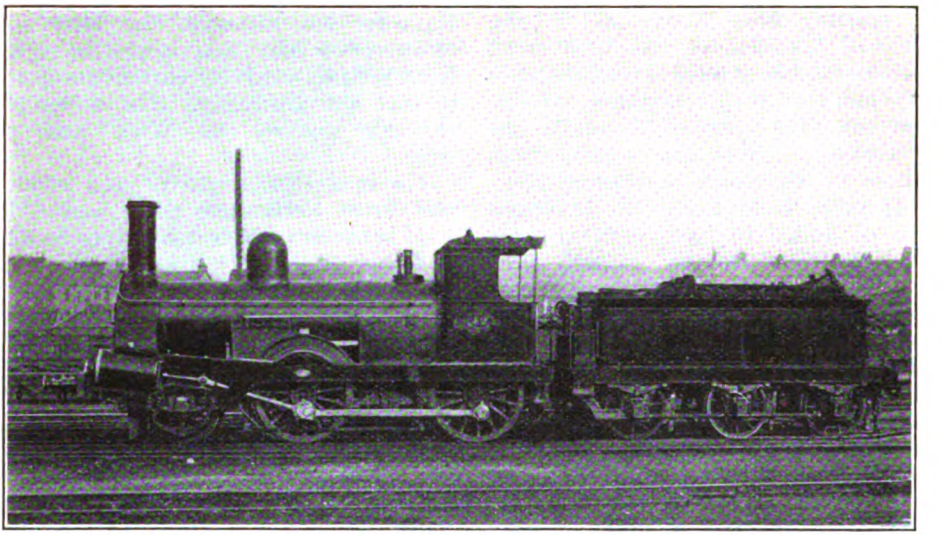

Photo.] [*Loco. Publishing Co., Ltd.*

2-4-0 GOODS LOCOMOTIVE No. 42 (SERIES 36-45)

Built by Sharp, Stewart & Co., 1864. Rebuilt, 1883. Coupled wheels, 5 ft. 3 in. diam. Cylinders, 18 in. by 24 in.

opened in 1870, but the final 10½ miles to Kyle of Lochalsh were not completed until 1897.

In 1874, there were about 420 miles of line, all of which were single except about half-a-dozen miles. To work this great length of railway there were only 67 engines, so that it will naturally result that there will not be much to write about when it comes to locomotive performances at this period. In dealing with the engines, I shall take the newest ones of that period first, because they happened to be the main line express engines. And when I use the term "main line," I refer only to the southern section between Inverness and Perth, for not only was this section the only one over which anything approaching a moderately "fast" train ran, but generally speaking the engines that worked over it were different from those which worked over the northern section between Inverness and Wick.

All the passenger engines of the Highland Railway bore names, which in nearly all cases represented the family seats of the directors, counties, and towns on the railway. But the engines had a somewhat awkward habit of going unto the shops and changing their names every few years. Sometimes the old names disappeared altogether, and in other cases they were unnecessarily transferred to other engines of the same type. And if a branch line engine was transferred to another branch, it was immediately re-named to suit the topography of its new surroundings.

The express engines in 1874 were ten in number, built in that year by Messrs. Dübs and Co. to the designs of Mr. D. Jones, who was chief locomotive superintendent from 1870 until 1897. They were of the 4-4-0 type with outside cylinders 18 in. by 24 in. and coupled wheels 6 ft. 3 in. in diameter. The boilers had a tube heating surface of 1,132 sq. ft., firebox heating surface 96 sq. ft., making a total of 1,228 sq. ft. The grate area was only 16¼ sq. ft., and the pressure 140 lb. per sq. in. The following is the list of these engines, the names in the first column being those which they orginally carried, the other names being those to which they were subsequently altered. One engine, No. 67, managed to get through a long career without having its original name changed.

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No.	Original Name.	Renamed
60	*Bruce*	*Sutherland.*
61	*The Duke*	*Duke.*
62	*Perthshire*	*Stemster, Huntingtower.*
63	*Inverness-shire* ..	*Inverness*
64	*Morayshire* ..	*Seafield.*
65	*Nairnshire*	*Dalraddy.*
66	*Ross-shire*	*Ardvaela*
67	*Cromartie*	—
68	*Caithness-shire* ..	*Caithness, Muirtown.*
69	*The Lord Provost* ..	*Sir James.*

In 1876, a similar engine No. 4, *Ardross*, was built by the Highland Railway at Lochgorm works, Inverness. This engine became No. 31 in 1899, and was re-named *Auchtertyre*, about 1900 or 1901.

These engines were stationed at Perth and Inverness, and worked almost entirely on the main line between those places. During the 'nineties, as newer engines came out, they drifted to the northern section of the line. At the end of the century, 1897 to 1900, they were supplied with new boilers having 150 lb. pressure, and were sold out of service between 1907 and 1909, except the old *Ardross*, which lasted until 1913, and No. 67, *Cromartie*, which is still in service as 67A.

The passenger engines which worked between Inverness and Wick, and also on the Elgin and Keith lines, were of the 2-4-0 type, also with outside cylinders. They were of the well-known "Allan Crewe" pattern, so greatly cherished in Scotland. I gave some account of the gradual spread of Allan's designs from Crewe to Aberdeen in my account of the Caledonian Railway, and when the Inverness and Nairn Railway was opened in 1855, it was adopted at once by the locomotive superintendent of that line who, I believe, was a relative of Alexander Allan. Mr. Stroudley, of Brighton fame, who was chief locomotive superintendent of the Highland Railway from 1865 until the end of 1869, did not alter the type, as he had no occasion to design any new passenger engines for the line, and Mr. David Jones, who had been on the railway since 1855, retained it almost until the year of his resignation.

These engines were built by Hawthorn (Leith), between 1855 and 1863, and the last 16 of the class by Neilson & Co., in 1863-4, and all were single engines when they were originally constructed. I should think that, except for the Inverness and Elgin, and Inverness and Dingwall sections, single engines would be thoroughly out of place on the heavy

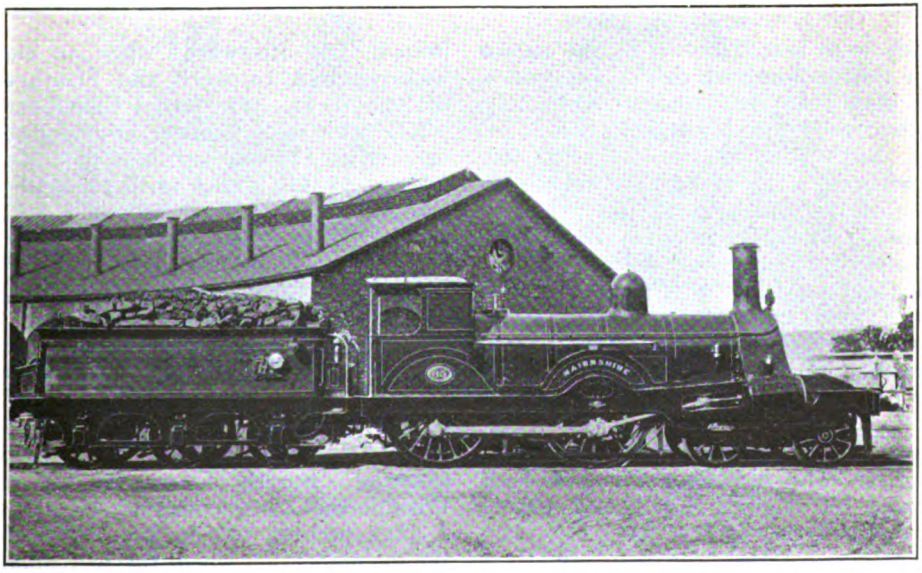

Photo.] [*Loco. Publishing Co., Ltd.*

4-4-0 EXPRESS ENGINE No. 65, "NAIRNSHIRE" (SERIES 60-69).

Designed by Mr. D. Jones, and built by Dübs & Co., 1874. Coupled wheels, 6 ft. 3 in. diam.
Cylinders, 18 in. by 24 in.

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gradients of the Highland Railway, nevertheless they worked all the trains for a number of years, until Mr. Stroudley converted No. 1, *Raigmore*, and No. 2, *Aldourie*, into 2-4-0 engines, and in later years most of the others were similarly altered by Mr. Jones between 1871 and 1892. No. 2 remained at work until after the close of the century, and for many years worked the most northerly line in the country, the branch from Georgemas Junction to Thurso.

The other engines of the 2-4-0 (converted) class were:

No.	Original Name.	Renamed.	Built by	Year.
28	*Glenbarry*	*Grantown*	Hawthorn (Leith)	1863
29	*Highlander*	*Forres*	Hawthorn	1863
30	*Prince*	—	Neilson	1863
31	*Princess*	—	Neilson	1863
33	*Atholl*	*Birnam*	Neilson	1863
34	*Seafield*	*Perthshire*	Neilson	1863
35	*Kingsmills*	*Islabank*	Neilson	1863
46	*Clachnacuddin*	*Kingussie*	Neilson	1864
47	*Lovat*	*Beauly*	Neilson	1864
48	*Cadboll*	*Dingwall*	Neilson	1864
49	*Belladrum*	*Helmsdale*	Neilson	1864
50	*Aultnakiah*	*Badenoch*	Neilson	1864
51	*Caithness*	*Blair Atholl*	Neilson	1864
52	*Dunphail*	—	Neilson	1864
53	*Stafford*	*Golspie*	Neilson	1864
54	*Macduff*	—	Neilson	1864
55	*Cluny*	*Sutherland, Invergordon*	Neilson	1864

They were better known by the names in the third column which they bore when they were coupled engines. Originally they had single driving wheels, 6 ft. 1 in. diam. and cylinders 17 in. by 22 in., but when Nos. 46 to 55 were rebuilt as 6 ft. 3 in. coupled engines, the cylinders became 17 in. by 24 in. The conversion to coupled engines was only gradually carried out, and No. 30 *Prince* remained a single engine until 1891.

Two other 2-4-0 coupled engines remain to be mentioned; these were No. 1 *Raigmore* and No. 3 *Ballindalloch*, which came out from Lochgorm works in 1877, having 6 ft. 3 in. wheels and 16 in. by 24 in. cylinders. The old *Raigmore* had been scrapped, but engines Nos. 1 and 3 were probably not entirely new, parts of broken up engines having been used in their construction.

Nearly all the above coupled engines were employed chiefly on the northern section between Inverness and Wick, and a number of them worked on the Elgin and Keith trains from Inverness. Some of the 46 to 55 series frequently piloted the main line trains over the Perth road.

The "single" engines remain to be mentioned. Of these there were a number of the engines previously mentioned, and one of the class, No. 32, for a long time named *Cluny*, was never converted to a coupled engine. There were also Nos. 12 and 13 with 6 ft. wheels, and 16 in. by 20 in. cylinders. No. 12 had been converted into a single driver side tank engine, and bore the name *Breadalbane*. For many years it worked the Aberfeldy branch, but afterwards when an engine was required to work the Strathpeffer branch, it was transferred there, and of course was re-christened *Strathpeffer*, to fit in with its new surroundings. It remained on this branch until 1890, when a new tank engine was built which replaced it on this line. No. 13, *Thurso*, was for many years employed on the northern branch between Georgemas Junction and Thurso and remained a single tender engine, until it disappeared about 1890.

It would naturally be considered that for goods traffic over a line like the Highland with its steep gradients, a six-wheels coupled engine would at least have been essential. But the six-coupled engine on this line was conspicuous by its absence. I have pointed out in previous articles the deep affection which the Scotchman of the last century bore for goods engines with four coupled wheels, and the Highland Railway was no exception to the rule. The 2-4-0 goods engines employed were of the usual Allan design, derived from

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the old "Crewe goods" having outside cylinders. There were some 28 of the class in all, the coupled wheels having a diameter of 5 ft., and the cylinders either 17 in. by 22 in. or 18 in. by 24 in. Some were used for banking all trains over the Dalnaspidal and Dava Summits, where a "pusher" behind was required. The goods traffic on the line was largely hauled in mixed trains with the goods wagons in front, and the passenger coaches in the rear.

The staple traffic of the district may be stated to consist very considerably of sheep from the interior, and of fish from the coast branches.

Finally there were half-a-dozen small side-tank engines, of which three were 0-6-0 shunting engines of Mr. Stroudley's design. These had 3ft. 8 in. coupled wheels, and 14 in. by 20 in. cylinders, and were built by the company at Inverness between 1869 and 1874. They were Nos. 56 *Balnain*, 57 *Lochgorm* and 16 *St. Martins*.

The other three tank engines, of the 4-4-0 type for passenger traffic came out a few years later and were Nos. 58 *Burghead*, 59 *Highlander*, and 17 *Aberfeldy*. They were built in 1878–9 at Inverness, and had 16 in. by 24 in. outside cylinders, and coupled wheels 4 ft. 9 in. diam. In general appearance they were not unlike a small edition of the present day North London tank engines. Nos. 58 and 17 worked on the branches, after which they were named, and 59 worked on the Keith and Portessie branch for some time. It was many years later transferred to Aviemore, whence it ran trains to Carr Bridge, when this first section of the short cut to Inverness was opened.

(*To be continued.*)

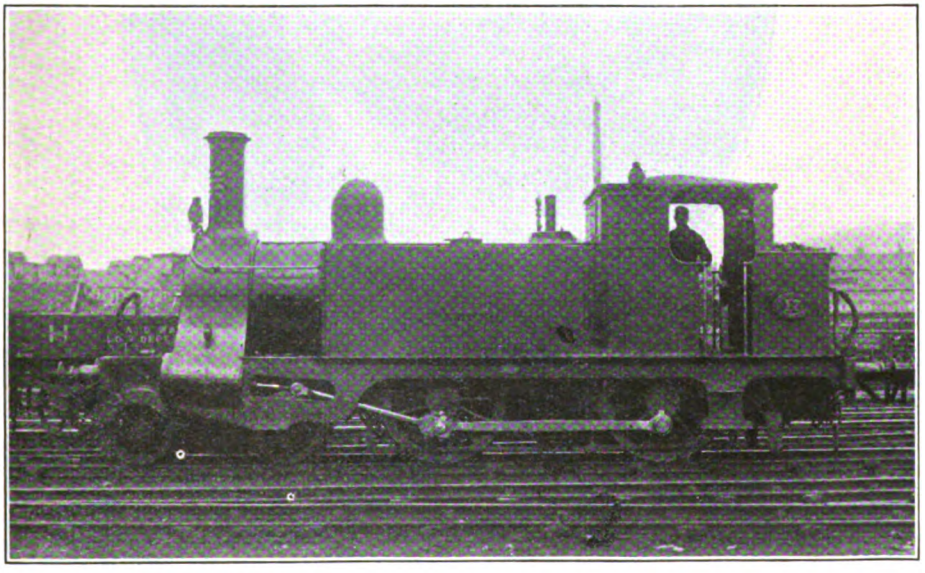

Photo.] **4-4-0 TANK ENGINE No. 17.** [*Loco. Publishing Co., Ltd.*

Built by the Highland Railway, 1879. Coupled wheels, 4 ft. 9 in. diam. Cylinders, 16 in. by 24 in.

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THE RAILWAY PORTRAIT GALLERY.

Photo.] **SIR GILBERT CLAUGHTON, BART., J.P.,** [*Elliott & Fry.*

Chairman,

London & North Western Railway Company, 1911–21.

WE regret to learn of the resignation, owing to failing health, of Sir Gilbert Claughton, Bart., J.P., from the Chairmanship of the London and North Western Railway Company. He joined the Board in 1905, became one of the Deputy-Chairmen in 1909, and was elected Chairman in 1911. A baronetcy was conferred upon him in 1912, and during the war he rendered important national services. He has throughout been exceptionally popular, both in the railway service and in business circles. Born in 1856, his father was Bishop of St. Albans, and his mother a sister of the first Earl of Dudley. For 20 years he was Chief Mineral Agent to the Earl of Dudley; for four years he was Mayor of Dudley, and for a considerable period served as Chairman of the Finance Committee of the Staffordshire County Council, of which he is an Alderman. He is a Director of many "Black Country" undertakings, also of Barclay's Bank, the North British and Mercantile Insurance Company, the Scottish American Oil and Transport Company, &c. Sir Gilbert was Chairman of the Railway Companies' Association, 1915–17. Though retiring from the Chairmanship, Sir Gilbert retains his seat on the London and North Western Railway Board.

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THE RAILWAY PORTRAIT GALLERY.

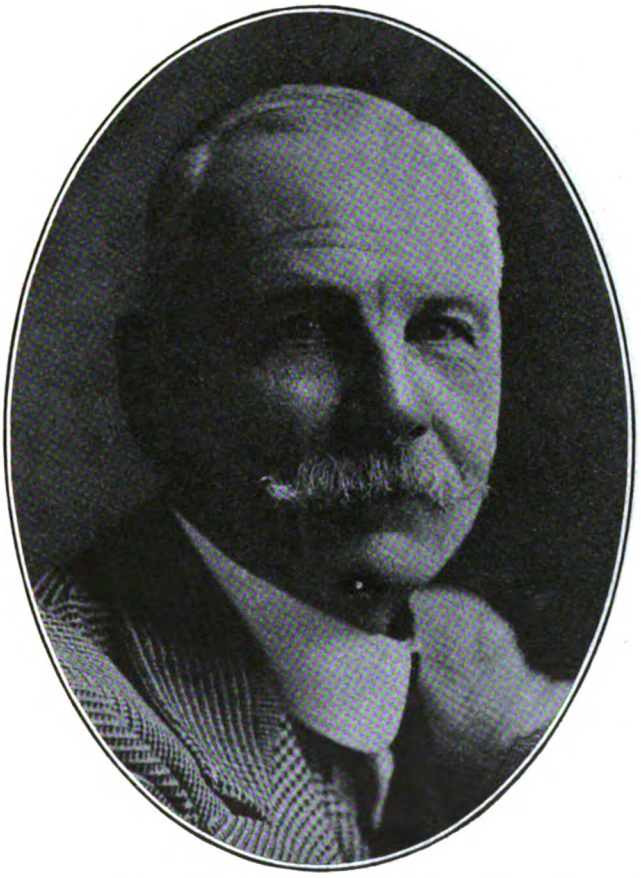

Photo.] **HON. CHARLES NAPIER LAWRENCE,** [*G. E. Houghton.*

Elected Chairman,

London & North Western Railway Company.

THE HON. CHARLES NAPIER LAWRENCE, who succeeds Sir Gilbert Claughton, Bart., as Chairman of the London and North Western Railway Company, has served on the Board for many years. In 1904 he became one of the two Deputy-Chairmen, then a feature of the London and North Western Railway Board, his colleague from 1909 being Sir Gilbert Claughton. On the appointment of the latter as Chairman, he became the only Deputy-Chairman. He is a son of the first Lord Lawrence of the Punjab, the eminent Indian administrator, and is a brother of General the Hon. Sir Herbert Alexander Lawrence, K.C.B., who was Chief of the General Staff to Earl Haig during 1918 and 1919. The Hon. Charles Napier Lawrence is also Chairman of the Antofagasta (Chili) and Bolivia Railway Company; the Chilian Northern Railway Company; the Ocean Marine Insurance Company, Limited; and the Railway Passengers' Assurance Company, Limited; while he is Chairman of the London board of the North British and Mercantile Insurance Company, and a Director of the North London Railway Company, the Shropshire Union Railways and Canal Company, and the Argentine Great Western Railway Company.

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THE RAILWAY PORTRAIT GALLERY.

Photo.] **MR. CHARLES ALDINGTON, C.B.E.,** [*Elliott & Fry.*

General Manager,

Great Western Railway, 1919–1921.

MR. CHARLES ALDINGTON, C.B.E., who is retiring in consequence of ill-health from the position of General Manager of the Great Western Railway, entered the service in 1876, serving first at Handsworth and Knowle. In 1879 he was transferred to the divisional offices in Birmingham, and three years later he joined the Northern Division staff at Chester. In 1894 he came to London as Chief Clerk to the London Divisional Superintendent. In 1899 he left to take the position of Traffic Superintendent of the Central London Railway, but in December, 1902, he returned to Paddington, in the General Manager's department. A year later he was appointed Assistant to the Superintendent of the Line, and in 1907 became Assistant Superintendent, succeeding the late Mr. Joseph Morris as Superintendent in January, 1911. In 1918 he was created C.B.E. in recognition of special services during the war. In March, 1919, he was appointed Assistant General Manager, and in July, 1919, on the death of Mr. Frank Potter, he was appointed General Manager.

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THE RAILWAY PORTRAIT GALLERY.

Photo.] **MR. FELIX J. C. POLE,** [*Elliott & Fry.*

Appointed General Manager,
Great Western Railway.

MR. FELIX J. C. POLE, who succeeds Mr. Aldington as General Manager of the Great Western Railway, joined the service in the telegraph department at Swindon in October, 1891, and held posts for a short period at Port Talbot and Truro. In January, 1893, he was transferred to the office of the electrical (now signal) department at Paddington, where he remained about three years. From 1896 to 1904 he was attached to the personal staff of the Chief Engineer, and in the latter year was transferred to the General Manager's office. Whilst in the engineer's office he became Editor of the *Great Western Railway Magazine*. Mr. Pole continued to be responsible for the magazine after it had been taken over by the company, and issued as an official publication, and until early in 1919. He was in 1913 appointed Chief Clerk to the General Manager, and in March, 1919, became Assistant to the General Manager. For several years he was Secretary of the company's side of the Great Western Railway's Conciliation Boards and also of the Supervisory Staff Conferences. He took an active part in the formation of the Great Western Railway Lecture and Debating Society. In August, 1919, he became Assistant General Manager.

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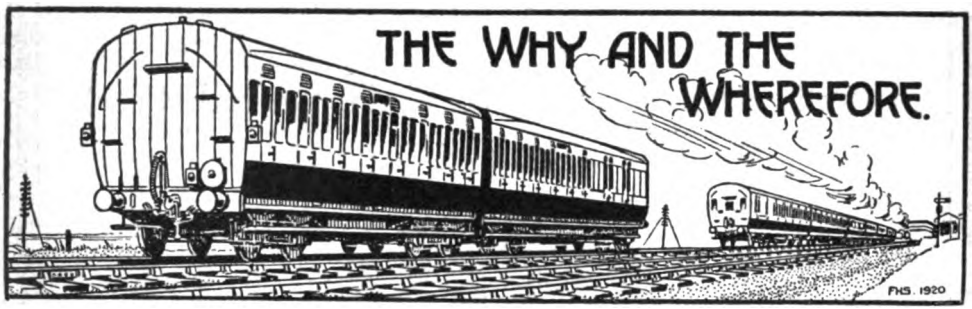

RAILWAY MAGAZINE readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to locomotive sheds and to the dimensions of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. Queries respecting British Locomotive Practice and Performance should be sent to Mr. Cecil J. Allen, c/o RAILWAY MAGAZINE, 30, Fetter Lane, Fleet Street, London, E.C.4. Queries should not be of purely local interest. No reader should forward more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history and the like, readers should consult the pages of the "Railway Year Book." The twenty-fourth Annual Edition of this standard railway reference work is now on sale, 5s. net, or by post from the RAILWAY MAGAZINE Offices, 5s. 9d.

Gravesend-Bedford Railway.

The paragraph published last month was based upon information supplied, as we have no exact details of the scheme. At the same time it may be pointed out that one object is to open up new country; hence the proposed line may involve a certain degree of duplication, though this is not likely to favour the realisation of the scheme, and it should be sufficient to reach both the London and North Western Railway and the Midland Railway at Luton. It must be remembered, however, that there is already direct communication from Tilbury to the Great Eastern Railway at Romford; via Barking and Stratford with the Great Eastern Railway system as a whole and over the North London Railway with the Great Northern, London and North Western and Great Western Railways; and via the Tottenham and Forest Gate Railway with the main Midland system. Obviously the scheme is very much "in the air" at present, and its most valuable feature is likely to be the Gravesend Tunnel, a proposal which is brought forward periodically. Possibly if the Channel Tunnel is made there may be justification for a new line as suggested; at present it is by no means certain that such a line would attract anything like the traffic suggested. So many of these "cross" connecting railways have failed to justify themselves in practice, at least to the extent anticipated by their promoters.

[Reply to C. F. KLAPPER.]

"SYX" Electro-Mechanical Train Stop.

A shoe under the engine is raised by contact with a ramp on the track, and by mechanical connections moves a stop which normally holds the brake valve, which is thus released to apply the brakes. In the connections is a toggle lever, one arm of which is under the influence of an electric solenoid, and if electric current is also collected from the ramp, as should be the case if the signal is clear, the solenoid is energised to stiffen the toggle, and thus to hold the stop in opposition to the brake valve, notwithstanding that it would otherwise be moved out of the way. Consequently, though the brakes tend to be applied mechanically at every ramp, they are held off if electric current is also received. This is at distant signals, but at a stop signal a higher lift, or the striking of a trigger by wings on the ramp causes the brakes to be applied without possibility of release until the train has stopped. Here also the passing of an electric current prevents the brakes being applied.

[Reply to H. A. POPER.]

Distant Signals.

The object of a distant signal is essentially to give an advance warning of

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conditions ahead. Hence an adverse distant necessarily conveys the indication that a driver must be ready to pull up very shortly, so that in many instances, as when approaching sharp curves, and at the entrances to terminals where careful running is essential, or the line may not be clear throughout its length, distant signals are retained permanently "on," or they may be fixed and unprovided with moving mechanism. There is thus a permanent warning, and though enginemen necessarily know this, they are required to act as if the signals might be "off" were the warning not required. "Calling-on" arms have a different purpose. They are used to bring trains forward when conditions prohibit the lowering of the "stop" arm above. They might be used in similar circumstances, but where there is a distant there is also a "stop" arm which it repeats.

[Reply to A. J. S. HANDS.]

London and South Western Railway 4-2-2-0 Locomotives.

These engines have two outside cylinders set back somewhat on the frames to drive the rear pair of driving wheels, and with Joy outside valve gear. There are also two inside cylinders, with ordinary link motion, driving the leading pair of driving wheels. There are no coupling rods. As all cylinders use boiler steam there is no need for the two sets to be "in time," for each works quite independently. Were the cylinders compound the steam supply would have to adapt itself and this was one of the chief reasons why the Webb three-cylinder compound uncoupled engines on the London and North Western Railway were relatively unsatisfactory. Obviously, uncoupled wheels could not be used were there any direct connection between the valves of the two sets of cylinders, requiring actual synchronism.

[Reply to L. CARR.]

Positions of Signal-Boxes.

Hall Royd Junction is ½-mile east of Todmorden on the Lancashire and Yorkshire main line. Proof House Junction is ¾-mile on the London side of New Street Station, London and North Western Railway. Hawkshead Box is 1⅜ miles north of Potter's Bar on the Great Northern main line. Clarence Goods Yard, Great Northern Railway, is on the down side between Holloway and Finsbury Park, but there is no box of that name. Boxes controlling passenger lines between King's Cross and Finsbury Park, are King's Cross East and West, Belle Isle Down and Up, Copenhagen Junction, Holloway South, Holloway North Up and Down, and Finsbury Park Boxes 3 to 6 inclusive.

[Reply to "HAZELDEAN" and "ABERYSTWITH."]

Birr & Portumna Line, Great Southern & Western Railway.

We are informed by Mr. E. A. Neale, General Manager, Great Southern and Western Railway, Ireland, that the Birr-Portumna line, 12 miles in length, was opened for traffic in 1868, and worked by the Great Southern and Western Railway under agreement, with the Government. After 10 years, on the expiration of the agreement, negotiations for a further agreement fell through, and the line remained idle. The Government Department concerned withdrew from possession in 1883, after which the line disappeared bit by bit.

[Reply to J. PITMAN.]

Train Staff.

The ordinary train staff was first introduced by Mr. Henry Woodhouse on the London and North Western Railway about 1850, for controlling train working through Standedge tunnel, on the Huddersfield and Manchester line. Its use was added to Board of Trade requirements in 1860. Electric train tablets came into vogue about 1890, and were first used on a portion of the Callander and Oban Railway. The electric train staff, which followed very soon after, was introduced first by the signal department of the London and North Western Railway.

[Reply to W. R. ACROYD.]

A Locomotive Comparison.

London and North Western Railway "Precursor" class 4-4-0 engines are longer and heavier than any 4-4-0's on the London, Brighton and South Coast Railway, but the Brighton class "13" 4-4-2 superheater tanks are heavier and more powerful engines than the London and North Western "Precursor" tanks. We do not know how you can expect to "procure a book containing a drawing of *all* locomotives in the British Isles,

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seeing that the number is something well over 30,000.

[Reply to H. S. HACK.]

London and North Western Railway and other lines.

Your query is a very indeterminate one, but it is probably met by the answer that the Stratford-upon-Avon and Midland Junction Railway is the first line, north of London, to make connection with the London and North Western Railway main line (at Blisworth). Except for a short distance near Preston (joint with the Lancashire and Yorkshire Railway) the London and North Western Railway runs exclusively upon its own metals all the way from Euston to Carlisle.

[Reply to J. M. ANDERSON.]

Patricroft to Clifton Junction, London and North Western Railway.

This line, which runs from Patricroft (not Eccles) to Clifton Junction, is the property of the London and North Western Railway. It is one of the numerous connecting lines in that area, but we cannot trace that any regular passenger train services are worked over it. The map in the RAILWAY YEAR BOOK is therefore correct, though necessarily it cannot show this complicated district in complete detail owing to the unavoidable smallness of the scale.

[Reply to A. ALDRIDGE.]

North British Railway Locomotives.

Inside cylinders are the rule on the North British Railway, except in the case of the "Atlantics." Tenders on the North British now bear the lettering "N.B.," with a crest in the centre in the case of passenger engines, and large numerals denoting the number on the tenders of freight engines. Colour of North British engines has a great deal more brown in it than shown on the card you send, but the latter has the appearance of having faded.

[Reply to I.P.H.L.].

Rail Wheel Guard.

We are informed by Mr. P. C. Tempest, C.B.E., General Manager, South Eastern and Chatham Railway, that the section of rail placed sideways on Artillery Street bridge, below London Bridge station, was fitted in place of a badly rotted timber guard. Similar guards have been in use for some time on Rochester Bridge, and also for many years on the Great Central Railway, their purpose being to prevent a wheel leaving the track in the event of its flange mounting on to the rail.

[Reply to H. A. POPER.]

Swansea-The North per London and North Western Railway.

We doubt if sufficient through traffic could ever develop between Swansea and the North of England to make a non-stop express between Swansea and Shrewsbury a paying proposition. There would also be difficulties as to locomotive water supply on so long a run, as there are no track-troughs on this route. We are not in a position to prohesy as to future Central Wales developments.

[Reply to E. S. JONES.]

A North Eastern Mystery.

You must be mistaken in thinking that the train arriving in Durham from York at 4.48 p.m. before the war ever conveyed Midland coaches which had travelled "via Hellifield." For very many years, however, this train (3.30 p.m. from York) had attached a through Midland portion from Bristol to Newcastle, *via Sheffield*, and it is doubtless this working to which you refer.

[Reply to "DUNELMIAN."]

"Cornish Riviera" Express, Great Western Railway.

This is an ordinary express run by the Great Western Railway Company, having no feature of note other than the record length of its non-stop run to Plymouth, the longest non-stop journey in the world. There is no working stop between Paddington and Plymouth for the purpose of changing engines, or engine or train crews.

[Reply to E.G.N.C. and "ABERYSTWITH."]

Furness Railway Rolling-Stock.

Carriages are now painted ultramarine blue, but possibly some still remain in service with white upper panels. No doubt the four-wheeled wagon noted with two passenger carriage and two wagon wheels had the former as being available at the time of repair or replacement.

[Reply to W. K. NASH.]

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Distances, North British Railway.

Glasgow (Queen Street, Low Level) to Craigendoran, via Clydebank (Central), 20 miles 60 chains; via Singer, 21 miles 50 chains; via High Street, Alexandra Park, Drumchapel and Singer is about 2½ miles further than by the direct route. From Queen Street (High level) via Cowlairs West and North junctions is 3½ miles shorter.

[Reply to "WEST HIGHLAND."]

Great Western Railway 4-4-0 No. 4123.

We are informed by a Bristol reader that 4-4-0 No. 4123, which at one time bore the name "Herschell" in a large oval number-plate on the cab side, is now working in the Bristol district with a standard number-plate and no name. This is probably the explanation of your having apparently seen two engines bearing the same number.

[Further reply to A. R. HARRISON.]

Ambiguous Queries.

We do not know what you mean by "Belpaire superheaters" seeing that the Belpaire is a square-topped type of railway firebox, whereas the superheater is part of the boiler equipment; you are evidently confusing two entirely different things. Your second query also is not clear, as you do not tell us to what particular signalling installation you refer.

[Reply to F.H.V.P.]

Single Line Working Abroad.

Various systems of instrument control are used in the different Continental countries, including, we believe, the arrangement whereby the clearing of the starting signal at one end of the section locks that for the reverse direction at the other. Suitable exchange of code signals would, however, be necessary, though we are unable to give exact details.

[Reply to K. BATTERSBY.]

French Railway Signals.

The small arm to the right of a post, below a left hand electric semaphore signal, is an indication to a signalman or watchman from the box in rear that a train or engine is on its way to him. It has no significance to train men. The arm is painted yellow. See article on French railway signalling in the February 1918, RAILWAY MAGAZINE.

[Reply to K. BATTERSBY.]

Great Northern Trains at Cambridge.

We are not aware that any special difficulties have ever arisen in dealing with Great Northern Railway trains at Cambridge. Occasionally a carriage or two may be outside the platform, requiring the use of steps; or, if necessary, the train can be dealt with at the main platform.

[Reply to W. R. ACROYD.]

London Road Station, Manchester.

Platforms A, B and C are used by Great Central Railway trains; and Nos. 1, 2, 3, 4, and 5 by London and North Western Railway trains. Adjoining are three platforms in the Manchester, Altrincham and South Junction station, and two in the Mayfield station beyond.

[Reply to J. M. ANDERSON.]

Distant Signal Warning Boards, Belgian State Railway.

These boards, placed about 50 yards apart and bearing in sequence, one, two, three, four or five stripes, as noted by you in Belgium, are warning boards indicating the progressive approach to a distant signal, more particularly for guidance in fog.

[Reply to C. A. MCLAREN.]

First Railways in Cornwall.

The Bodmin and Wadebridge, opened 1834, was the first line in Cornwall. This was purchased by the London and South Western Railway in 1845. See articles by Rev. J. B. Baron Collins, RAILWAY MAGAZINE, September, October, November, 1911.

[Reply to "SHOOTING STAR."]

Double Manning of Locomotives.

An expression used to denote that engines are manned by two pairs of enginemen, one pair taking over the engine from the other pair, so that the engine does double duty. This practice has, of course, very greatly increased since the introduction of the eight-hour day.

[Reply to E.G.N.C.]

2-8-0 R.O.D. Locomotives.

A certain number of these engines are in possession, temporarily, of the Great Eastern Railway, and are used to work heavy freight trains over the Great Northern and Great Eastern Joint line between March and the North.

[Reply to L. JONES.]

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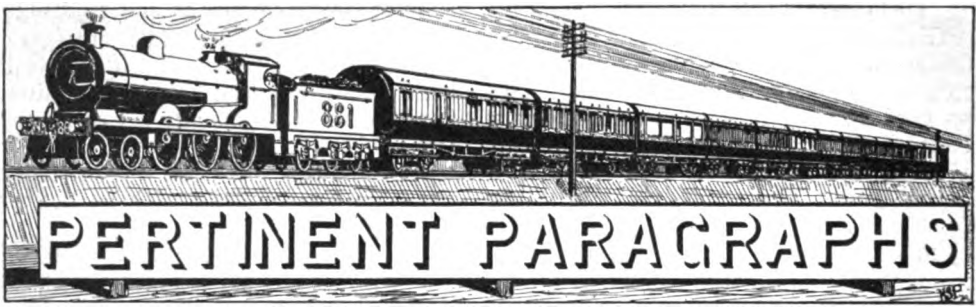

The Railways Bill, 1921.

In explaining the Railways Bill, when it received its Second Reading, Sir Eric Geddes laid great stress upon the wide differences in cost of railway transport here and in other countries, naturally to the disparagement of British railways. He acknowledged however, the exceptionally high capital cost of the home lines—£56,000 per mile here, £26,000 in Prussia and £16,000 in U.S.A. He also stated that British railway track is not worked so hard as in those countries, on the ground that different standards limit the free movement of rolling-stock, while in the United States an average wagon load of 23·5 tons is secured, in Prussia 8·8 tons and Great Britain 5·4 tons.

But such argument is dangerously specious; it is the sort of argument beloved of the pre-war advocate of nationalisation, as it may prove anything or nothing, according to the point of view, and the extent of the knowledge or ignorance of hearers or readers.

High capital cost is the "millstone" round the neck of British railways, partly the penalty of our pioneer position, but largely due to legislative action in the past, the virtually entire absence of anything in the nature of State assistance, and the high valuation of land and property which had necessarily to be secured in the past. Incidentally, a very high standard of construction and equipment has to be worked to, which is not the case with the light-traffic and secondary lines in other countries. High capital cost is therefore a legacy from the past which cannot be evaded, and it is reflected in every section of railway working, so that in one way or another it accounts for a substantial percentage of the excess transit costs of the United Kingdom over the other countries cited.

The loading gauge does not affect goods and mineral traffic, which is mainly in question, to any very great extent, for we can also run 30, 40 and 50-ton wagons if desired, and a good number are in service. Where the loading gauge does come in, however, is at the loading and unloading places, and these are frequently not on railway premises, but in colliery and works sidings, docks, &c The chief cause of the high cost of transit per mile, beyond that due to the effect of high capital costs, is the short haul. Accepting terminal costs as a fixed figure, hauls of 200, 500, 1,000, or 3,000 miles create tremendous differences in the average of relatively dear terminal and proportionately cheap haulage charges, so that in a country of long hauls operation may appear to be very much more efficient although the facts may be quite different. In any case British conditions render it impossible to parallel American operating results, and all over the Continent similar differences go far to explain why rail transport in the United Kingdom is relatively expensive. We say nothing of the quick transit so usual here, and numerous special facilities (many are charged as extras abroad or are not supplied at all) to which our traders are accustomed, but the foregoing remarks will be sufficient to indicate that statistics baldly presented may easily convey inaccurate suggestions. Also, if track is not worked so hard on the basis of tonnage passing, with a lower wagon load enforced by circumstances there may be a much greater actual traffic passing.

The Benefits of Grouping.

Sir Eric Geddes anticipates that this will realise a benefit of £25,000,000 in six or seven years' time. Speaking at the North Eastern Railway meeting, Lord Knaresborough reduced this to three or four millions, which appears to be much nearer the probable mark. In any case, as far as they are likely to prove valuable, working agreements and the like were already finding considerable favour before the war, and it is only the change of public opinion which has cleared the way for this method of realising operating economies. We are rather inclined to agree with Sir Frederick Banbury, that all that is required is relief from the maximum charges specified in the various railway Acts of Parliament, an obvious necessity seeing that these are all based upon the conditions of bygone

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years. It does not follow that the elimination of maxima will open the way to unreasonably high charges In fact, the doctrine of "what the traffic will bear" has generally in the past resulted in an elastic interpretation of rates and charges in favour of the trader, and not, as is often assumed, in rigid insistence upon the last penny which can be imposed. Indeed, the weakness of the proposed standardisation of rates is rather that it will tend to reduce the numerous ways in which railways have, in the past, endeavoured to meet and assist their "customers."

Fortunately, despite these possible grounds for serious differences between the views of practical railway officers and the advocates of complex and expensive statistics, standardisation, &c., there are strong indications that the main provisions of the Bill will meet with relatively little opposition, while there is plenty of room for compromise ere the Bill becomes law. The Scottish companies are strongly against the grouping proposals as they stand, mainly because the standardisation of wages, rates and charges, affect them more severely because of their pre-war lower standards of charges, wages and general costs. Hence their appeal for association with English companies where the incidence of post-war increases is not quite so acute. But many problems have yet to be settled, such as the effects of standardisation of wages where the return of service is not commensurate; and the extent to which even the new grouped companies will be able to suit the conditions and requirements of their "customers" and at the same time pay their way; while it has yet to be seen whether grouping and "improved" methods will, in practice, realise even a reasonable proportion of the somewhat extreme estimates claimed in certain quarters.

Railway Companies and the Railways Bill.

CIRCULAR letters have been issued by the Chairmen of the respective railway company directorates. In general the terms are similar, and that of the London and North Western Railway may be quoted as an example.

It commences by explaining that constant and arduous negotiations have been taking place between the Railway Companies' Association and the Government, with the result that considerable progress has been made towards the composing of differences which had arisen, and the Bill as introduced by the Minister on June 11 shows a considerable modification in many respects of the scheme as outlined in the White Paper.

The main principles of the Bill are then set forth, as follows :—

(1) The railways are to be formed into groups by a process of amalgamation and absorption, on terms to be agreed, or failing agreement, to be determined by a tribunal, the grouping to come into operation on the first day of January, 1923.

The Bill provides for the undertaking of the London and North Western Company together with those of the Midland, Lancashire and Yorkshire, North Stafford, and Furness Companies, and certain other small subsidiary companies being formed into one group.

The companies are, however, free to propose any scheme of grouping according to their own choice, alternative to that of the Bill, the option extending up to June 30, 1922, and that scheme shall be approved by the Minister unless, in his opinion, it is incompatible with the economical and efficient working of the railway system. Both Houses of Parliament must also assent to the alteration.

(2) In regard to finance, the Government refused to entertain the suggestion that the guarantee of the 1913 net receipts should be extended for a period beyond August 15 next, but they have agreed to place at the disposal of the companies in Great Britain a sum of £60,000,000 in settlement of the claims arising out of the control, and that sum will be allocated amongst the companies on a scheme of apportionment set forth in the Bill, and will be available for the general requirements of the companies.

(3) The provisions as to the future regulation of the railways, including the gradual standardisation of plant and equipment, which have been inserted in the Bill, represent very substantial modifications of the original proposals of the Minister.

(4) The provisions for the new rate-fixing machinery are on the lines generally of the report of the Rates Advisory Committee. Rates are to be fixed so as to secure to the Companies a standard revenue equivalent to the net receipts of 1913, plus allowances for recent capital expenditure, for unfructified capital, and also to cover whatever may have to be paid for interest on fresh capital. In addition, the formula for future adjustment of rates is so stated that if and as working expenses fall, and granted improved trade conditions, the amalgamated companies will be enabled to attain by gradual steps a higher level of earning power.

(5) The clauses as to management provide that the directors of the new amalgamated companies shall be qualified proprietors, elected by the proprietors.

In regard to wages and conditions of service, effect is given to the arrangements which have been arrived at by negotiation between the railway companies and the

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trade unions, whereby it has been agreed to continue (unless otherwise determined by 12 months' notice) the Central and National Wages boards, and to establish for each group Councils composed of officers and elected employees whose functions will be generally on the lines of the Whitley Report on Industrial Councils.

This is an arrangement which your Board believes will operate both in the interest of the shareholders and the staff. It also provides suitable machinery for the adjustment of labour questions on economic lines, and should be of material help in the settlement of such questions.

The Government having decided that the present constitution and administration of railways shall be altered, the Bill as introduced, so far as the main principles and broad features are concerned, meets to a considerable extent the views of your Board. There are, however, many details of the Bill—some of them of even critical importance—which will need watchful consideration and careful amendment during the progress of the Bill through Parliament. In regard to such amendments the companies have reserved to themselves full liberty of action, and if, during the proceedings, difficulty should arise upon any question of substantial importance, which, in the opinion of your Board, makes it desirable for the proprietors to be consulted, a meeting will be called for the purpose.

Railway Stockholders and the Bill.

THE Central Council of English, Scottish and Irish Railway Stockholders' Protection Associations have also issued a statement as follows :—

They gladly recognise the absence from the Bill of the most objectionable features of the White Paper (Cmd. 787) issued in June, 1920, to which they have taken repeated exception in their interviews with the Minister of Transport and in their publicity campaign.

While approving generally of the Bill as a fair attempt to meet the interests of the parties concerned—owners, employees, and users—they feel that it requires more or less radical amendment in the following amongst other, directions :—

(1) The powers to be exercised by Government departments should be restricted as far as may now be practicable to the powers exercised by the Board of Trade prior to the war, and should all be exercised by the Board of Trade and the proposed new Railway Rates Tribunal.

(2) The clauses relating to exceptional rates should be deleted, as they would operate seriously against the interests of the trade of the country.

(3) The Scottish railways should be grouped with the English railways, with which in the past they have been associated, in accordance with the scheme of grouping suggested by the Railway Companies' Association in their letter of December 8, 1920, to the Minister of Transport.

(4) The hitherto unquestioned right of the railway companies to control their own capital expenditure within their statutory powers should be maintained.

(5) The interests of the stockholders under the provisions for the amalgamation and absorption of the companies are not sufficiently safeguarded, and the provisions of sub-section (ii) of the proviso to Clause 6 would be unfair to the smaller companies. The Council are also of opinion that there should be some right of appeal from the decision of the Amalgamation Tribunal.

(6) The expenses of the Amalgamation Tribunal should not be thrown upon the Railway companies, nor should the whole expense of the Rates Tribunal be cast upon them.

(7) The sum of £60,000,000, which it is proposed to pay the railway companies, should be in full and final settlement of all claims on the termination of control.

The Central Council are taking the necessary steps to place the foregoing views before Members of Parliament, and before the public by means of meetings which will shortly be held throughout England and Scotland.

The Railway Nationalisation Society and the Railways Bill.

A PAMPHLET, R.N.S. No. 17, has been issued by the Railway Nationalisation Society, price 1d., expressing the views of the Society. The pamphlet commences by summarising the proposals of the Railways Bill now before Parliament, and then makes a series of observations. In regard to grouping, this is considered to " fall short of its logical outcome, which would be complete unification." It is suggested that as freight transport is as " nation-wide " as the transport of post parcels, &c., " to be consistent the Government should suggest the breaking up of the National Post Office into six post offices each worked by a separate company." In the finance section doubt is expressed as to whether rates can be maintained at a high enough level to secure the companies the desired profits, " until such time as the Government and/or the oil monopoly take steps to raise the cost of road transport to a level satisfactory to the railway companies." Certain of the finance and rates provisions meet with the Society's approval, but in other cases somewhat strongly worded comments are made. Thus, in regard to the power given to traders, &c., to apply to the

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Railway and Canal Commission to order "reasonable service, facilities and conveniences," objection is made to the provision that "if the capital required for the purpose cannot be provided or expended as proposed without prejudicially affecting the interests of the existing stockholders, the order must not be made." This is commented upon thus: "Public interest is aimed at; but not if it interferes with dividends! Imagine a fire brigade run on these lines!" It must be obvious, however, that the original clause simply ensures that the matter shall be fully threshed out, and that while the railway company remains a commercial enterprise, it must be preserved from compulsory action for the benefit of the public which cannot be supported on a commercial basis. In conclusion, while the Bill is regarded as an improvement on the existing system, it is considered as merely pointing the way to complete nationalisation. To a considerable degree the pamphlet is well argued; but we still adhere to our own opinion, that in so far as the present proposals approach the nationalisation principle it is the trader and the public who are likely to be least well served in the long run, and that the retention of private enterprise, whether in the form of six, or sixty, or six hundred companies, is vital to the continuance of commercial, efficient and solvent railway operation; besides being most conducive to general public benefit. Sound commercial methods are not usually associated with State undertakings, and the necessity for maintaining solvency which has always to be faced by private enterprise, has usually resulted in the public being best served, and there is no reason to anticipate that our railways, with their long record of useful service under such conditions, will prove an exception, once the peculiar circumstances and complications due to temporary State control and the occurrences of the war period are settled.

New Appointments on the Great Western Railway.

IMPORTANT changes affecting the official staff of the Great Western Railway are announced as we close for press. In consequence of ill-health, Mr. C. Aldington, C.B.E., is retiring from the position of General Manager, and is succeeded by Mr. Felix J. C. Pole, Assistant General Manager. Portraits and biographical particulars are given respectively on pages 50 and 51. Mr. Aldington has been associated with many of the modern developments which have rendered the Great Western Railway one of the most progressive lines in the Kingdom. Mr. Pole affords a striking example of the possibilities the future may offer to a young man of untiring energy, and capable and enthusiastic in the performance of his duties. We offer our congratulations to Mr. Pole upon his selection to fill this important office.

Mr. C. A. Roberts, C.B.E., Chief Goods Manager, is also retiring, having completed 50 years' service. He is succeeded by Mr. Edward Lowther. General Manager of the Port Talbot Railway & Docks Company, which undertaking is to be taken over by the Great Western Railway. Mr. Elias Ford, Assistant Chief Goods Manager, becomes Deputy Chief Goods Manager. Further reference will be made to these appointments next month, but the following brief notes may now be given:—

Mr. Lowther joined the North Eastern Railway at the age of 17, eventually becoming Chief Inspector in the Mineral Department, at Gateshead and Newcastle-on-Tyne. In 1900, he was appointed Traffic Manager of the Port Talbot Railway & Docks Company, of which, two years later, he became General Manager.

Mr. Roberts joined the Great Western Railway in 1871 as a junior clerk. At the age of 22 he was appointed stationmaster at Wells. Thence he was transferred to Aylesbury in the same capacity, afterwards serving as Traffic Canvasser in Manchester, and Goods Agent at Wrexham, and then at Neath. He was next promoted to be Chief Clerk to the Gloucester District Goods Manager, and three years later succeeded his chief. In 1896, he was placed in charge of the Bristol District, coming to Paddington in 1904, as Assistant Chief Goods Manager. In 1912, he became Chief Goods Manager.

Mr. Elias Ford joined the Great Western Railway in 1884, at Plymouth. In 1890 he was transferred to Paddington, eventually being placed on the personal staff of the General Manager. In 1905, he was appointed Chief Clerk to the Worcester District Goods Manager, and 16 months later was transferred to Cardiff in a similar capacity, becoming Assistant District Goods Manager at Cardiff, in 1912, three years later being placed in charge of the district. In 1918, he became Assistant Chief Goods Manager.

The Abermule Accident.

WE have already dealt so fully with this lamentable accident, even more to be regretted because of the slackness of working indicated than in view of its disastrous results, that there is no need to do more than to consider Colonel Pringle's comments as contained in his report to the Minister of Transport. The cause of the accident is simple, that the local train was allowed to proceed with a wrong tablet in the possession

of the enginemen, both of whom lost their lives, also the guard of the express and 14 passengers. In regard to the station staff, among whom the report imputes responsibility for irregular practices in dealing with tablets, for the growth of this, blame is primarily attributed to the permanent stationmaster (who was on leave), while the inspection staff are not free from responsibility. Immediate responsibility is placed upon the acting stationmaster, the signalman, and the two youths—"both well-intentioned lads, but not of an age to understand the danger that may arise from dual responsibility, ill-considered action and careless speech." This section of the report concludes with the remark that "the case as a whole is an illustration of how fatal misunderstandings may arise from allowing a number of people to participate in the use of single-line instruments, and in the duty of receiving and handing tablets, and as such it forms an object lesson to all traffic inspectors, stationmasters and signalmen concerned with single line working, of the importance of the strictest discipline in carrying out the regulations for the custody and transference of tablets."

Increasing Safety of Single Line Working.

VARIOUS proposals for increasing safety on single lines are then discussed. Varying the colouring of staves or tablets for successive sections is dismissed as of little help—it is doubtful whether on a line having numerous single-line sections, traversed equally in either direction, and therefore in opposite sequence, the colouring would be any help to enginemen. The use of tablet and staff instruments alternately is regarded as practicable, but its value is doubtful and would render it inconvenient to exchange tokens at speed. Placing tablet or staff instruments in the signal cabins is favoured, but it is pointed out that in the case of a previous accident, also on the Cambrian Railways, this was the situation, but it did not secure safety. Other proposals relate to mechanical or electrical inter-locking of tablets or staves to control the starting or advanced starting signal. This is regarded as the best method of obtaining additional security, "always assuming that the instruments are properly used, and the driver obeys the fixed signals." It has been adopted on one of the main railways, and is in use at special places on other railways. So far, however, this interlocking has not been made a requirement by the inspecting officers. "Single line working by any of the approved methods has, during the past 30 years, provided so high a degree of security on British railways, that the necessity for going to the additional expense of further improving safety conditions has not, so far been recognised.

"The circumstances attending this accident, however, justify reconsideration of the general question, especially in respect of stations which are passing places, as well as electric tablet or staff posts, on single lines of railway. Where for one or other of the reasons above mentioned, it is not feasible to move the instruments from the booking office into the signal-box, it is recommended that electric interlocking should be provided between the single line token and the starting, or advance starting, signals which control movements into the relative single line section. It does not appear at the present moment, having regard to the degree of security attainable when due regard is paid to regulations for single line working, that a general recommendation to provide this interlocking at all tablet or staff posts is justifiable. But in special circumstances, *e.g.*, at places where single line tokens are exchanged at high speed, it will be advisable to provide such interlocking even when instruments are located in signal-boxes. It will be for companies to diagnose the necessity for such an addition in each case."

Reference is also made to telescoping, and special construction of rolling-stock to avoid it, as practised on the Great Gentral, Metropolitan District and other lines. The report concludes by suggesting that the question of the equipment of new passenger stock with devices to resist the tendency to over-ride, which causes serious loss of life, and injury from telescoping in cases of accident, be reviewed by the committee of railway experts, who are now engaged in standardisation of rolling-stock.

Oil Fuel and the Railways.

IT was inevitable that in order to meet some of the difficulties occasioned by the fuel situation, the use of oil should be largely adopted by railways. Hence nearly every line has been busily adapting locomotives to burn oil, using the Holden, Scarab, or other apparatus, with the result that early in June quite a number of railways were able to *increase* their attenuated strike train services. The Great Eastern led the way, by issuing the somewhat remarkable poster reproduced. It will be remembered that when Mr. James Holden first introduced oil burning on the Great Eastern Railway the main object was to utilise the waste from the oil-gas plants, for which reason a special point was made of the ready adaptation of the locomotives for using either oil or coal. In fact, an important feature is that oil is sprayed upon a bed of ordinary fuel. This system

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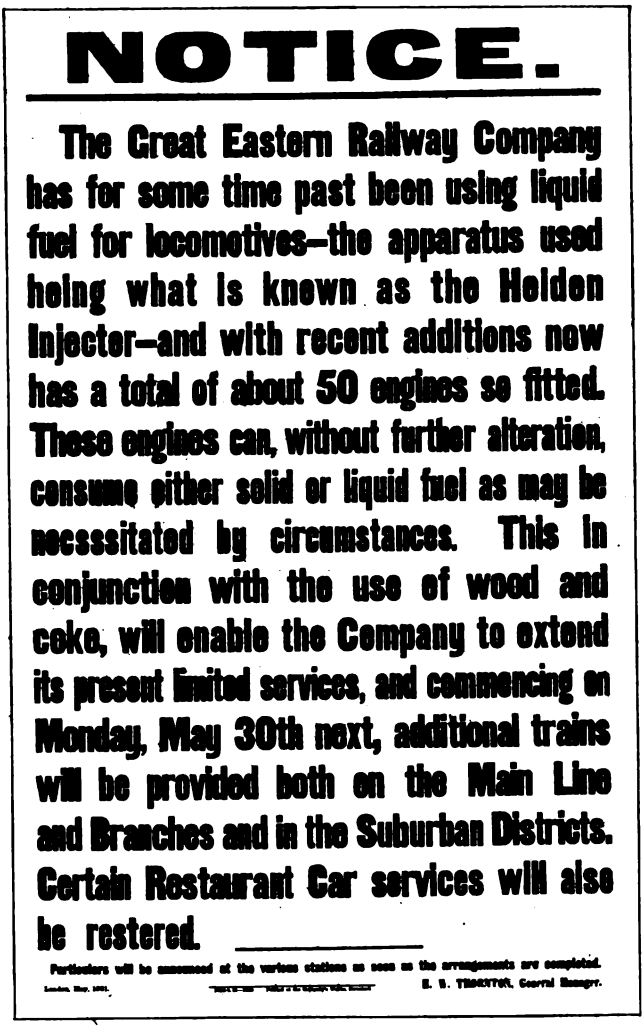
has found wide acceptance abroad, but the increased cost of oil, even of the crude qualities which could be used for the Holden burners, caused oil burning gradually to disappear, even on the Great Eastern Railway. Therefore, whereas 20 years ago there were as many as 60 Great Eastern Railway locomotives adapted for burning oil, the number gradually dwindled until only one or two remained. There were, however, a number of tenders still in service designed to include oil tanks, and, in so far as fittings were still available in stock, the work of conversion to meet the present emergency has been facilitated The oil-burning engines now available are chiefly of main line classes, but, as they are brought into use, it has proved practicable to bring further suburban and branch locomotives back into service, using coal, coke and wood. Even the oil burners require supplies of these fuels, but as they depend mainly upon oil they need only moderate quantities.

The London and South Western, Great Central and South Eastern and Chatham and other railways followed with particulars of reinstated trains. Indeed, in the case of the Great Central virtually every train in and out of Marylebone station was operated by oil-burning locomotives, and on June 12 the Sunday Suburban Services were replaced. On various lines express trains were reinstated, but as a rule relief was given to the more congested general services, to break up long train intervals, and to improve branch and connecting facilities, with a number of additional trains of a suburban or outer-suburban character. In several instances, too, restaurant cars were reinstated on principal trains.


NOTICE.

The Great Eastern Railway Company has for some time past been using liquid fuel for locomotives—the apparatus used being what is known as the Holden Injector—and with recent additions now has a total of about 50 engines so fitted. These engines can, without further alteration, consume either solid or liquid fuel as may be necessitated by circumstances. This in conjunction with the use of wood and coke, will enable the Company to extend its present limited services, and commencing on Monday, May 30th next, additional trains will be provided both on the Main Line and Branches and in the Suburban Districts. Certain Restaurant Car services will also be restored.

Particulars will be announced at the various stations as soon as the arrangements are completed.

E. H. TINDETTE, General Manager.

FACSIMILE OF POSTER ISSUED BY THE G.E.R.

The International Railway Association.

A REPORT has been issued by the International Railway Association, written by Mr. Colson, Vice-President of the Permanent Commission, setting forth the history of the Association. To some extent we have already reviewed this since the change of title and the resumption of activities after the war; but a few other facts may be noted.

The first congress was held in Brussels in 1885, and this led to the formation of a permanent association, ratified at Milan in 1887. Subsequent sessions were held at Paris (1889), Petrograd (1892), London (1895), Paris (1900), Washington (1905), and Berne (1910). A congress was to have been held in Berlin in 1915, and some of the reports prepared therefor will be presented at the Rome congress in 1922. The French editions of the Bulletin was first published in 1887, the English in 1896. The following countries are now members: Argentine, Belgium, Bolivia, Brazil, Chili, China, Costa-Rica, Cuba, Czecho-Slovakia, Denmark, Dominica,

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Egypt, Ecuador, France, Algiers, Tunis and Colonies, Great Britain and Ireland, Indian Empire, Protectorates and Colonies, Greece, Holland and Colonies, Haiti, Italy, Japan, Luxemberg, Mexico, Nicaragua, Norway, Paraguay, Peru, Poland, Portugal and Colonies, Rumania, Salvador, Spain, Kingdom of Servians, Croatians and Slovenish, Siam, Sweden, Switzerland, United States of America, and Uruguay.

Altogether 260 railway administrations are now included in its membership, representing 227,619 miles of line. Membership is restricted to systems owning more than 100 kilometres (62 miles) of line.

For the 1922 Rome session, 78 reporters will deal with 20 questions, and the following may be noted, in so far as British railway officers are directly concerned:—(1) Construction of road bed and track: Mr. E. F. C. Trench, C.B.E., L. and N.W.R.; (2) Maintenance and supervision of track: Mr. C.. J. Brown, C.B.E., G.N.R.; (3) Reinforced concrete: Mr. W. W. Grierson, G.W.R.; (4) Economic production and use of steam on locomotives: Mr. G. J. Churchward, C.B.E., G.W.R.; (5) Bogies, axles and springs of locomotives: Mr. G. Hughes, C.B.E., L. and Y.R.; (6) Passenger carriages: Mr. R. W. Reid, M.R.; (7) Slow freight traffic: Sir H. A. Walker, L. and S.W.R.; (8) Liquid fuel for locomotives: Sir Henry Fowler, M.R. Among the present members of the Permanent Commission we note the following British railway directors, officers, &c.: Sir C. M. de Bartolomé, Ministry of Transport; Mr. G. Behrens, director, M.R.; Rt. Hon. Evelyn Cecil, M.P., director L. and S.W.R.; Viscount Churchill, G.C.V.O., Chairman, G.W.R.; and Sir Guy Granet, director, M.R.

Sir Herbert Walker on the Railway Situation.

At a recent Rotary Club luncheon, Sir Herbert Walker, K.C.B., General Manager, London and South Western Railway, speaking on the railway situation, said that before dealing with the present position of the railways in this country, he should like to go back to a little ancient history. A hundred years ago, railways as we knew them to-day were non-existent. The first railway in this country was opened in 1825. It had been the policy of our legislators ever since to encourage the formation of a large number of small railways. Rightly or wrongly, our legislators had looked upon competition as the life of business, which had induced them to take this step. The result had been that there were several hundreds of separate railway undertakings. The Great Western Railway itself was formed of 137 different corporations, which was the history of many of the big railway undertakings. But the separate undertakings had been reduced to something under 200, which were not all working. There were to-day over 50 separate working railways. The shareholders of those companies had subscribed altogether £1,250,000,000. The average return was 3·64 per cent. Eliminating £200,000,000 of what was called watered capital, the average interest was just about 4 per cent. He hoped the firms represented at the luncheon paid considerably higher dividends than that.

He then considered briefly the effect of the Regulation of the Forces Act, 1871, and the railway position during the war period leading up to the statement that in 1920 expenses had gone up from £76,000,000 to £225,000,000, and revenue had only gone up from £120,000,000 to £228,000,000; the State had to make up the difference. Reviewing the causes which had led to this position, Sir Herbert said that the coal bill alone was costing £18,000,000 a year more than before the war; but the primary cause of the trouble was the increase in wages. It was true that the Government put the control of the railways under an Executive Committee, consisting of 12 managers of the principal lines, but they were fettered in every way that a Government could fetter a commercial undertaking. The Government increased wages far beyond anything the Committee recommended, and gave the men better conditions of service. They did what was perhaps the most wicked thing that had ever been perpetrated on the community—the introduction of the eight hours' day. He was a believer in a man doing no more than eight hours—though he did not practise it himself. But in many cases railwaymen did not work during the time they were supposed to be on duty. In a country place a signalman might be required to work only five minutes during an hour. This meant that the companies had to increase their personnel by 76,000 men, and they had 25 per cent. put on the wages bill. The wages bill last year had gone up from £47,000,000 to £160,000,000. They started this year with a prospect of a wages bill of £173,000,000. Amongst other things the Government imposed upon them onerous conditions of service, such as the guaranteed day. Under that if you brought a man on for two or three hours you had to pay him a day's pay. Should a man be brought on on Sunday morning for an hour and then perhaps another hour in the evening, he had to be paid for a day at time and a half.

The average rate of pay of the railwayman before the war was 27s. a week. The

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war bonus at the beginning of this year was 46s. a week, which was added to the 27s. Every shilling given to the railwayman meant a million and three-quarter pounds per annum. Wages had already come down 4s. He hoped that in June they would be down another 4s., and by October, a further 4s. That was 12s. of the 46s. By this time next year there should be another drop of 4s. As with each 4s. there was a 25 per cent. reduction in overtime rates, he hoped that by this time next year wages would be reduced by £1. He, for one, hoped that by the end of next year they should be in a position to earn the same net revenue as in 1913. That was what the Bill before Parliament was designed to help.

New Great Eastern Railway Continental Service.

COMMENCING July 2, there will be added to the series of Continental services operated from Harwich (Parkeston Quay), a new one to and from Zeebrugge, which should appeal strongly to visitors to the Belgian coast resorts, the Belgian battlefields, the old Flemish cities, and the Belgian and Luxembourg Ardennes. The Great Eastern Railway t.s.s. *Roulers* will be used. This boat is well-equipped, the sleeping accommodation includes many of the popular two-berth deck cabins, and there are state rooms, ordinary cabins and dining, ladies' and smoking saloons, &c. Leaving London on Mondays, Wednesdays and Saturdays at 8.40 p.m. (8.30 p.m. while the restrictions due to the coal crisis apply), passengers travel by restaurant and Pullman car trains to Harwich, permitting of table d'hote dinner during the journey, while miscellaneous refreshments are also available. Harwich is left at midnight, reaching the Mole at Zeebrugge at 6.5 a.m. Trains in connection are due at Bruges, 6.45 a.m.; Ghent, 7.35 am. and Brussels (Nord), 8.40 a.m. Connections are also given to Ypres, Namur, Liège, Verviers, Cologne, Strasburg, Bâle, &c.; while steam trams and other conveyances are available between Zeebrugge and Heyst, Knocke, Blankenburghe, Ostend, Mariakerke, Middelkerke, Westende, Lonbaertzyde, Nieuport, Furnes and other Belgian coast resorts. The return service leaves Zeebrugge at 11.30 p.m., on Tuesdays, Thursdays and Sundays, reaching Harwich in time for the restaurant and Pullman car express leaving at 6.30 a.m., and due in London at 8 a.m. (10.30 a.m. while train service restrictions apply). Through bookings will be operative to most of the Belgian towns, and baggage can be registered through. Further particulars can be had from the Continental traffic manager at Liverpool Street Station, where also accommodation can be reserved. On the return journey reservation can be booked at the Great Eastern Railway offices, 41, Adolphe Max, Brussels; Quai de la Station, Hangar 14, Antwerp, or on Zeebrugge Quay.

Cheap Railway Travelling in Early Days.

COMMENTING upon the "Pertinent Paragraph" on the old poster of 1856, reproduced in the June RAILWAY MAGAZINE on page 413, our contributor, Rev. W. J. Scott, B.A., sends an extract from a time-table of June, 1857, applying to the 11.45 a.m. train from Euston to Sheffield. Consisting only of coaches for the Midland Railway, it called at Wolverton at 1 p.m., and reached Rugby at 1.45 p.m. Leaving behind a Midland engine 5 minutes later, Leicester was reached at 2.20 p.m. A stop was then made at either Sponden or South Junction Box on the curve outside Derby station to connect to and from Derby station (dep. 3.5 p.m., arr. 3.20 p.m.) and then proceeded via the "straight road" to Eckington, arriving at 4 p.m. Leaving with an M.S. and L. engine, a non-stop run was made to Sheffield (Victoria), due 4.30 p.m. Mr. Scott also mentions that there were four M.S. and L. week-day trains from Sheffield to Eckington via Woodhouse, and five in the opposite direction. In further explanation he adds that as the Midland then only reached Sheffield by Masborough, the M. S. and L. route over the Eckington branch was often the quickest from London. He believes, however, that the 11.45 a.m. from London above mentioned was the only one for the Midland line, though others may have had through coaches. The "avoiding curve" at Derby seems to have been in use from quite an early date—for some trains only.

The "Armistice" Railway Car.

A CAR formerly attached to Marshal Foch's special train in which the armistice was signed on November 11, 1918 was recently transferred to the Invalides in Paris and placed in the Court of Honour. The interior of the compartment is to be preserved in the same condition as it was on Armistice Day. A metal plate posted upon the wall recalls the great event. The car formed part of Marshal Foch's train, and after the armistice it was presented to the French Government by the Compagnie Internationale des Wagons-Lits, and was handed over by M. Noblemaire, President of the company, on the occasion of the inauguration at Verdun of the "Tranchee des Baionettes." M. Millerand, M. Poincaré, Mr. Wallace, the American Ambassador, and Marshals Foch and Joffre, and others took luncheon in the car, which formed part of the official train to Verdun,

and it was then that the President of the Republic expressed the wish that it should be placed in the Army Museum at the Invalides.

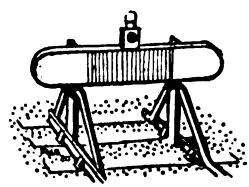
Box Tunnel, Great Western Railway.

MR. L. B. HEWITT directs our attention to correspondence published in the *Railway Times* in 1871, in reference to statements that the construction of the Box Tunnel might have been avoided and an easier route obtained on the only steeply-graded section of the original London and Bristol line. Even at this date the matter is of some interest, and we reproduce the letter in question, as it throws light upon the influences which in those days so often determined the routing of railways. The letter is as follows :—

"As regards distance, the case is precisely the opposite of what is stated. A reference to the Ordnance map will show that between Box and Chippenham the line makes a considerable bend to the south, and that the natural course of the line would have been up to the course of the Box Brook, through the south side of Hartham Park (where there is a considerable dépression that looks almost as if made for the purpose of the line), then to the north of Corsham Park, onwards to Chippenham. This course, if it could have been adopted, would have made a magnificent line from Bath to Chippenham, with an easy gradient distributed over 13 miles, and little, if any, tunnel. A course so obvious and desirable was not likely to have escaped the attention of Mr. Brunel, and the question at once arises why it was not adopted. The explanation, I believe, will be found in the great facilities that landowners then possessed for influencing the decisions of committees, by means of which those who had heard all evidence and best understood the merits of any given case were liable at the eleventh hour to be outvoted by the members induced to attend by persuasion and perhaps other considerations. Two landowners, one near Box, and the other Mr. Joy, Q.C., who then held Hartham Park, refused to listen to any terms, though in the one case an offer was made to build a new mansion 300 yards north of the proposed line, accompanied in both cases with ample and more than ample compensations. These parties turned a deaf ear to all proposals, and the Great Western, who had already lost one Bill in Parliament, could not venture to run the risk of another defeat. Hence, if my statement be correct, arose the construction of the Box Tunnel, with its bad gradient, great cost, and many inconveniences simply owing to the prejudices and influence of two landowners. I believe it will be found that the above statement is substantially correct and that a reference to the archives of the Great Western would confirm it."

A Curious Point in Railway History.

REFERRING to the queries raised by the Rev. W. J. Scott, B.A., on page 411 of the June RAILWAY MAGAZINE, Mr. G. N. Ford, O.B.E., Traffic Superintendent, North London Railway and London District Superintendent, London and North Western Railway, writes that he has made inquiry as to the working of North London trains through to and from Hounslow via Old Kew Junction between 1834 and 1858. The earliest news available is, however, that, during the latter part of 1858, a service of North London trains ran through to Twickenham via Kew Bridge, Barnes and Richmond, and some years later (about 1866) through to Kingston via the same route. From January 1, 1869, North London trains terminated at Richmond, travelling over the new Richmond extension line from South Acton Junction. In regard to the query as to the Brentford and Willesden service, as far as can be ascertained, the London and South Western Railway never ran regular passenger trains over the North and South Western Junction line.



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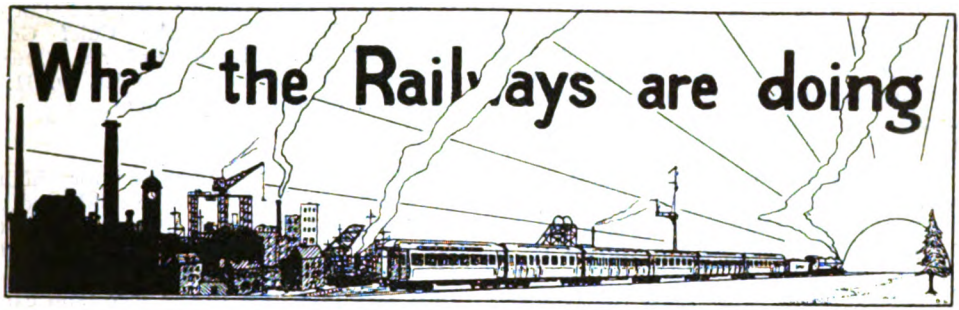

In the recent birthday honours bestowed by H.M. the King, the railway industry was well to the fore. First and foremost there was the peerage conferred upon the Right Hon. Sir Ailwyn E. Fellowes, Deputy-Chairman of the Great Eastern Railway, while Mr. W. A. Mount, M.P., a director of the Didcot, Newbury and Southampton Railway received a baronetcy, and Mr. Frank Gore-Browne, K.C., Chairman of the Rates Advisory Committee, a knighthood. Mr. R. W. Church, Mining Engineer to the Railway Board, was favoured with the Order of the Indian Empire, and on Mr. Robert A. McCall, K.C., Registrar to the Railway and Canal Commission, was bestowed the Royal Victorian Order. A baronetcy was conferred on Mr. Pierce Lacy, who is closely associated with the railway world, by being a director of the Metropolitan Carriage, Wagon and Finance Company, Limited.

* * *

Mr. W. Powell, Signal Superintendent, Taff Vale Railway, has retired. In 1883 Mr. Powell joined the service to take charge of the designing, installation and maintenance of the signalling and interlocking, responsible to the chief engineer, which position he has filled with much credit. The Taff Vale Railway is acknowledged to be one of the best signalled in the country. He is a Past President of the Association of Railway Companies' Signal Superintendents and Railway Engineers, and also a member of the Institution of Railway Signal Engineers.

* * *

Mr. Richard S. Dent, Works Manager of the Carriage and Wagon Department, North Staffordshire Railway, has been the recipient of an illuminated address and a purse of money on the occasion of his retirement after 32 years' service. The presentation was made at Stoke by Mr. John Welsh, Mr. J. A. Hookham, Locomotive Engineer, presiding. Mr. F. A. L. Barnwell, General Manager, wrote regretting his inability to attend, and wishing Mr. Dent a long and happy period of retirement. Those present included Major H. G. Ivatt, Chief Assistant to the Locomotive Engineer, and who has now been appointed to the control of the Carriage and Wagon Department also; Mr. E. C. Roberts, Chief Assistant to General Manager; Mr. A. F. Rock, Electrical Engineer; and Mr. P. Lonsdale, Chief of the Locomotive Running Department.

MR. RICHARD S. DENT,

Retired Works Manager, Carriage and Wagon Department, North Staffordshire Railway.

* * *

With the retirement of Mr. L. E. K. Thomas, Parcels Manager, South Eastern and Chatham Railway, it has been decided to discontinue the department. In future all local parcels matters will be dealt with by the Superintendent of the Line, London Bridge Station, whilst Continental parcels will come under the control of the General Manager (Continental Section), who will

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have a branch office at Victoria Station. It has also been decided to transfer the Continental goods traffic control from the Goods Manager to the General Manager's Continental Section, Victoria Station, S.W. 1.

* * *

To fill the vacancy on the board caused by the death of Mr. John Coghlan, the directors of the Dublin and South Eastern Railway have co-opted Mr. James C. R. Lardner, barrister, a director. They have also elected Mr. H. G. Burgess their deputy-chairman for the current year.

* * *

MR. ARTHUR STOWEY BAILEY, O.B.E., Managing Director of the Nottingham Railway Carriage and Wagon Works of Messrs. Cammell Laird and Co., Ltd., has been appointed a director of the company.

* * *

TRAFFIC management on the Uganda Railway was recently the subject of enquiry in the House of Commons, and Mr. Churchill in reply said: "Mr. McHardy's appointment as an Assistant Traffic Manager on the Uganda Railway and his subsequent promotion to be Deputy Traffic Manager were approved by my predecessors on the recommendations of the Governor. The claims and positions of other officers were considered at the time, and I have no reason to think that Mr. McHardy's appointment as assistant traffic manager and promotion to be deputy traffic manager were not fully justified."

* * *

QUITE up to the remarkable reputation of its pre-war predecessors was the recently held 29th Annual Summer Athletic Meeting of the London and North Western (London) Athletic Club. In addition to the usual gathering at Wembley of the leading officers of the London and North Western Railway, a number of Lancashire and Yorkshire Railway officers were also present. Among those representing the London and North Western Railway were: Mr. Arthur Watson, C.B.E., General Manager; Mr. C. F. Graseman, in his dual capacity as Assistant to the General Manager and Chairman and guiding spirit of the General Council of the London and North Western Railway athletic and social clubs, &c.; Mr. E. Wharton, Assistant to the General Manager; Mr. F. D. Stones, Assistant to the General Manager; Mr. J. F. Gee, Chief Accountant; Mr. F. W. Dingley, Chief Running Superintendent; Mr. G. N. Ford, O.B.E., London District Superintendent; Mr. L. F. Rowlandson, Chief of the Staff Section, Superintendent of the Line Department; Mr. A. T. Cotton, Mineral Assistant to the Chief Goods Manager; Mr. Glynne Roberts, General Manager's Department; and Mr. D. H. F. Meacock, Publicity Department.

* * *

ANOTHER essay competition for children of railway employees is to be conducted this year by the Railway Committee of the London "Safety First" Council. On the last occasion 45 prizes, value £20, and diplomas were presented to the successful candidates.

* * *

IN the House of Commons, in reply to a recent question concerning third-class railway season tickets, Sir Eric Geddes remarked: The railway companies are under no legal obligation to issue season tickets. I am aware that certain companies do not issue third-class season tickets between all their stations. Certain companies have already been asked to consider the extension of the issue of such tickets, but as such a course would, in their opinion, result in a loss of net revenue, I fear that it is not practicable to press the matter in present circumstances.

* * *

THAT large numbers of the general public are interested in the railway locomotive works of Great Britain has long been known and understood at the offices of the RAILWAY MAGAZINE, although not so readily realised elsewhere save within the four walls of the Railway Club, and such like institutions. Last year the experiment was made of throwing open the Midland Railway Locomotive Works at Derby for inspection by the workmen and their wives and families, and repeated this year on Whit Monday and Tuesday. That the privilege was appreciated is indicated by the fact that no fewer than 3,451 people went through the works, and the collection box for the local charities realised over £14. Special efforts were made to render the visit as interesting as possible, and it was a decided advantage that some of the shops were working during the visitations. The visitors were conducted over the works in parties of 50, and the round visit occupied about two hours. Sir Henry Fowler led off with the first party. The majority of the guides had been selected by the Shop Committee.

* * *

THREE more of the 4-4-0 passenger engines on the Somerset and Dorset Joint Railway, Nos. 67, 68 and 69, have been renewed with large boilers and Belpaire fire-boxes.

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As illustrated on this page the London, Brighton and South Coast Railway representative team (Brighton locomotive) won the Inter-Railway Ambulance Shield. This Shield was presented by the Order of St. John of Jerusalem in England in 1897, to commemorate the longest reign in English history and to encourage ambulance work on the railway. The photograph reproduced is that of the winning team, the names of the members being as follow:—From left to right standing: Mr. A. Alldritt (reserve), Mr. W. C. Townshend, Mr. C. F. Spencer, Mr. D. H. Patrick, Mr. A. Deacon (Captain), Mr. F. Sharp; sitting: Mr. J. King (Centre Secretary) and Mr. W. L. Girling (Assistant Centre Secretary and Trainer).

* * *

On the Great North of Scotland Railway ambulance work receives keen support. A recent report of the committee stated that the total number of employees holding certificates of efficiency was 660, equal to about 21 per cent. of the company's staff. At the conclusion of the war the percentage was 18, so that it had risen 3 per cent. during the last three winters. During the past 12 months the members of the Inverurie Locomotive Works section dealt with 1,268 cases, mostly in connection with the works. The Aberdeen and Kittybrewster sections also dealt with a large number of minor casualties during the year.

* * *

An auto-train worked by a small 2-4-2 tank engine of the "1300" class has been employed on the Woodford and Ilford line, Great Eastern Railway. We understand that this is one of the Palace Gates—Seven Sisters auto-trains temporarily diverted during the coal shortage.

* * *

Concerning London and South Western Railway locomotives and other rolling-stock, a Railway Magazine reader who signs himself "G. B. D." writes as follows:—

No. 316, an 0-6-0 goods engine has been fitted with one of Mr. Urie's superheaters. To do this, it was necessary to extend the frame, to allow for an extended smokebox, and a "stove-pipe" chimney of Mr. Urie's

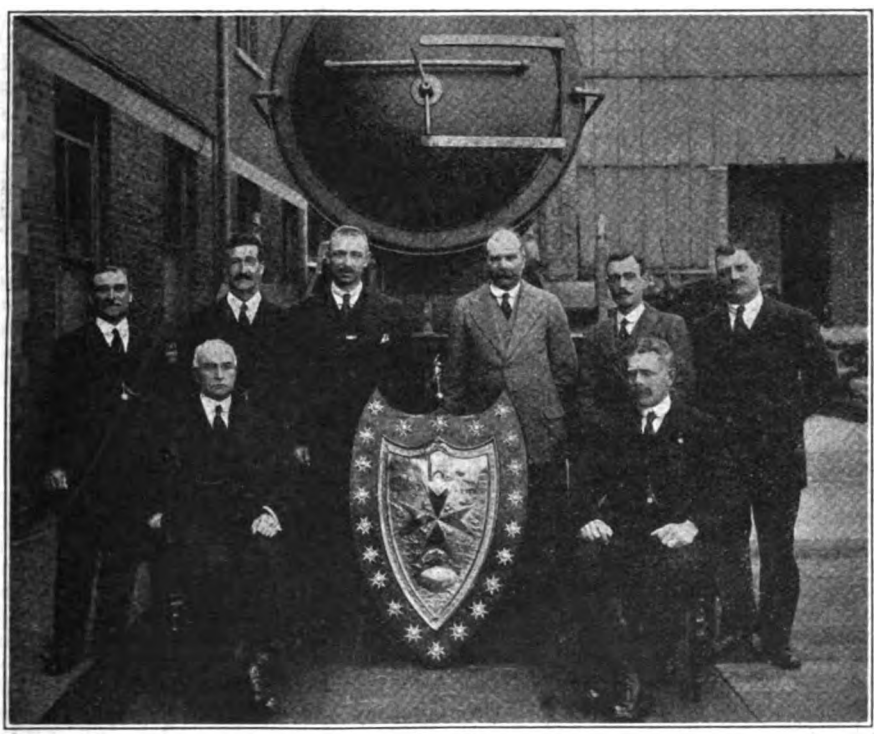

Photo.] [*Stanley Mann.*

LONDON, BRIGHTON & SOUTH COAST RAILWAY (BRIGHTON LOCOMOTIVE) REPRESENTATIVE AMBULANCE TEAM.

Winners of the Inter-Railway Ambulance Shield.

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design was fitted, also a Detroit lubricator. The engine retains slide valves. At the present moment No. 126, a Drummond 0-4-4 tank is being fitted with a superheater. The following Drummond 4-4-0 "Bulldogs" have been rebuilt with superheaters: 399, 415–419, 421–426, 428, 430, 432 and 433. No. 400 will shortly be in service as a superheater The new 5 ft. 7 in. 4-6-0 goods engines 496–515 are all completed, and the 4-8-0 goods tanks 492–495 are under construction; 492 will shortly be in service. These engines employ a combined vacuum and steam brake. The following engines are being converted for oil fuel by the Holden system: 4-6-0's 737 (ready for service), and 739, 4-6-0 goods 515, 4-4-0 rebuilt "Bulldogs" 415 and 423, and rebuilt Drummond 470. No. 424, a rebuilt "Bulldog" is being fitted with the Scarab system Several green P.L. vans and coaches are in service, also several electric trains, which are being painted the lighter shade of green, with yellow lining.

* * *

MR. J. W. B. TUNSTALL writes:—With reference to Mr. Hopwood's article on the Vale of Rheidol Railway in the June RAILWAY MAGAZINE, evidence of the heavy summer traffic carried by this little line may be given in details of a trip which I enjoyed last July. The train was composed of 12 crowded carriages, mostly bogies—an abnormally heavy load—hauled by 2-6-2 T. No. 1, and banked by 2-4-0 T. No. 3. No. 2 had broken down during the morning, consequently its badly-needed assistance was not available. The journey took 2 hours 10 minutes over the 12 miles, and we finally "stuck" on, I believe, the identical curve shown in the photo on page 366. A stupendous effort, resembling a volcanic eruption, on the part of No. 1 got us into the cutting near the Devil's Bridge, where we again stopped This time the train had to be divided, No. 1 taking the first portion into the terminus and returning for the second. The return journey to Aberystwyth was immediately commenced with apparently the same train (and the same passengers, plus considerable numbers of others) in charge of the 2-6-2 T., this journey being accomplished in about the usual time. The occasion was of course an unusual one (a fine day), and the consequent overwhelming crowds of passengers, together with a depleted loco. stud, caused this unavoidable dislocation of traffic

* * *

THE new series of London and North Western Railway four-cylinder "Claughton" class locomotives, referred to on page 423 of the June, 1921, RAILWAY MAGAZINE, is now complete and in course of being turned out, the remaining seven engines being numbered: 156, 157, 158, 161, 169, 179 and 180. The next and last series of the same type is being proceeded with, and the first four engines will bear Nos. 183, 192, 205 and 207. This, when finished, will make a total of 130 engines of the type referred to. Our Crewe correspondent, Mr. C. Williams, further reports that of the 90 4-6-0 passenger engines ("Prince of Wales" class) ordered from Beardmore & Co., 10 are expected in service shortly, as follows: Nos. 120, 123, 125, 129, 135, 140, 141, 142, 145 and 148 One of the "Alfred the Great" compounds No. 1974 *Howe* has been converted to superheater, and is the first compound to be so fitted Except for the mechanical lubricator, with which it has been fitted, there is no outward indication that the engine is superheated. Nos. 1933 and 1940, "Jubilee" class compounds, have been converted to "Renown" class (two-cylinder simple), whilst Nos. 2038 and 2387, four-cylinder compound mineral engines, have been simplified and superheated. The following 0-6-2 tank engines are equipped for working motor trains:—Nos. 442, 492, 770 and 991. Recent "cut-ups" include another of the 6 ft. 6 in. 2-4-0 "Precedents," viz., No. 517, *Marathon*.

* * *

FELIXSTOWE stands in a fine bay, facing due south, on the coast of Suffolk about midway between the rivers Orwell and Deben. It is an ideal resort for a holiday, and with its high sunshine record and general attractions is rapidly gaining a place in the hearts of City dwellers. From London (Liverpool Street Station) there is a convenient service of trains with restaurant cars, and the journey—about 84 miles—is covered in a little over two hours. The north of England is connected with the Great Eastern Railway by trains from York and Doncaster, via Lincoln and March, to Ipswich for the Felixstowe branch, and the Great Northern, London and North Western, and Midland railways join the Great Eastern at Peterborough and Cambridge.

* * *

THE foregoing paragraph is taken from an excellent brochure just published by the Great Eastern Railway, Liverpool Street, London, E.C. Entitled "Harry Furniss at the Felix," the pleasantly-written letterpress is illustrated by about 40 characteristic "Harry Furniss" sketches. The RAILWAY MAGAZINE reader to whom Felixstowe is still unknown except by name, should secure a copy of this charming literary and

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artistic production. From Felixstowe to the ancient port of Harwich is a short and interesting trip and so, quite wisely, Mr. Furniss has included five pages of illustrated description of this famous Harbour of Refuge, which, in addition to a history dating back to the days of King Alfred, likewise possesses a modern Great Eastern Railway Hotel. Copies of the book may be obtained gratis on application to the Great Eastern Railway.

* * *

FOR the undecided prospective holiday maker a book of the character of "Holiday Hints, 1921," published and gratuitously distributed by the Publicity Department, London & South Western Railway, Waterloo Station, London, S.E., is a veritable boon. It contains just the kind of information that is required in the family circle to bring about a decision on the vital question "Where shall we go this year?" Once that important matter is settled the book still has its uses, for it contains an extensive list of hotels, boarding houses, apartments, &c. Pleasingly illustrated, succinctly written and well mapped, the book is certainly a credit to the department responsible for its production. RAILWAY MAGAZINE readers should write for copies and judge for themselves.

* * *

A PROFUSELY illustrated handbook, entitled "Through the Garden of England," is being distributed by the South Eastern and Chatham Railway Company. It illustrates and describes the holiday resorts and residential districts in Kent, Sussex, Surrey, Berks and Hants served by the South Eastern and Chatham Railway. The districts in the two latter counties, so far as this railway is concerned, are choice if not extensive, but for the other three counties the book is extremely valuable, particularly in regard to the fascinating county of Kent. The advantages outlined are of special moment to the City man who finds it desirable to reside in the suburbs, or to have, in addition to his London home, a seaside or country residence. For him fast daily and week-end trains are a necessity. Special season-ticket rates are granted as a convenience to residents at the principal country and coast towns. Every year it becomes more generally admitted that the undecided home-seeker or the holiday maker in search of scenery, health and variety, need not wander far afield to find his elysium. Within a couple of hours' journey from London, or less, there may be found scenery and air to satisfy the demands of the most exacting. The handbook endeavours to do justice to the many advantages of the health resorts and beauty spots within easy reach of London on the South Eastern and Chatham Railway, and an intending resident will find in its pages much useful information. The RAILWAY MAGAZINE reader desiring a copy should communicate with the South Eastern and Chatham Railway Publicity Department, General Manager's Office, London Bridge, S.E.

* * *

BY the London, Brighton, and South Coast Continental services *via* Newhaven and Dieppe excellent connections are now made with the Paris to Bâle expresses. By the day service passengers leave London (Victoria Station) at 10 a.m. and arrive at Paris (St. Lazare) at 6.20 p.m. The Swiss express leaves Paris (Est) at 9.40 p.m., arriving at Bâle 6.40 a.m. Similarly by the night express, passengers leave London (Victoria Station) 8.20 p.m. and arrive in Paris (St. Lazare) 6 a.m., and leave Paris (Est) 8 a.m., due at Bâle 5.13 p.m.

* * *

ON and from June 10, the London, Brighton and South Coast Railway has given Isle of Wight connections with the trains leaving Victoria 1.40 p.m. and London Bridge 1.50 p.m. every week-day.

* * *

BEFORE the war the Hull-Zeebrugge joint direct service to the Continent of the Lancashire and Yorkshire and the North Eastern Railways was deservedly popular among business men and tourists from Scotland, Ireland, and the Northern and Midland counties of England. This summer season sees this comfortable and easy route restored. The service will be maintained by the turbine steamer *Duke of Clarence*, from Hull on Wednesdays and Saturdays, and from Zeebrugge on Mondays and Fridays until September 24, the fares being: first-class single, £2 2s., or first-class return, £4 4s. These fares include a berth on lower deck; if a berth is required on the upper deck an extra charge of 3s. each journey is made. A second-class single ticket costs £1, and a return £2, including the use of rugs as far as practicable. The turbine steamer engaged in the service is a vessel of reputation, being one of the finest on the Continental service. Both for first and second-class passengers every possible convenience and comfort is provided. In the second-class a separate cabin is set aside for ladies. The ship is lighted throughout by electricity, and fitted with wireless telegraphy.

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A SCHEME for a light railway between Ambleside and Keswick has been submitted for the approval of the Westmorland County Council. It was proposed to run the railway between the head of Windermere Lake and the Keswick Station on the Cockermouth, Keswick and Penrith Railway by way of Grasmere and Thirlmere, crossing Dunmail Raise by means of special engines. As the line would be constructed, wagons and carriages on the existing rails could be run through to Ambleside. The length of the line will be 16 miles, and the estimated cost of construction £150,000. Five lakes would be seen *en route*, including some of the finest scenery in the Lake District, and it was thought that it would become a popular tourist's line. Petrol-electric engines would be employed, and there would be no smoke and little noise.

* * *

SPEAKING at the Agricultural Hall, Islington, on June 2, on the eve of the opening of the Rubber Exhibition, Sir Ernest Birch said that noise experienced in all railway stations could be avoided. There was on exhibition a rubber flooring, and if any railway would undertake to cover its platforms at one of its great junctions, like Willesden or Clapham Junction, he would undertake to name a company that would provide the rubber free for the experiment.

* * *

FROM the Ministry of Transport comes the following announcement:—Notice is given by the Rates Advisory Committee, Ministry of Transport, that the railway companies have submitted provisional proposals for a special classification of dangerous goods by merchandise trains, copies of which may be obtained from the Railway Clearing House, Seymour Street, Euston Square, London, N.W. 1, price 5*s*. Any trader desiring to submit to the Rates Advisory Committee objections to the proposals of the railway companies, or alternative proposals on his own account, must obtain from the Secretary to the Rates Advisory Committee, Gwydyr House, Whitehall, London, forms for the making of such objections or proposals, and must lodge the objection or proposal on the said form on or before July 31, 1921. Notice will be given in due course of the date on which the proposed new classification will be considered. Objections or proposals should be limited to questions of classification and should not deal with the following matters: (1) whether any merchandise is properly included in the category of dangerous goods. (By the provisions of the Railways Bill now before Parliament, this question is to be determined by the proposed Railway Rates Tribunal); (2) The regulations and conditions under which dangerous goods shall be carried. (By the provisions of the said Railways Bill, dangerous goods shall be conveyed subject to such bye-laws, regulations and conditions as the railway company may think fit to make in regard to the conveyance or storage thereof.).

* * *

IN respect of the month of April, 1921, the Ministry of Transport has issued a statement showing the railway companies' claims against the State, put forward under the agreements made in the years 1914–17 inclusive. The Government liability as claimed of over £9,500,000 is far greater than in any previous month of control. Apart from the already existing depression in trade, the stoppage in the coal mines has had a most disastrous effect upon railway receipts. The claim includes the full net receipts earned by the companies in the corresponding month of 1913. The results of the Irish railways continue to be adversely affected by the disturbed state of the country. The claims cover expenditure charged during the month and also include the liquidation of liabilities arising prior to the month but charged in the current claim, including about £1,300,000 in respect of maintenance performed in excess of 1913 standard, and of arrears of maintenance overtaken.

* * *

IN the report of the directors of the Leopoldina Railway it is stated that the construction of the Magé line round the bay of Rio, connecting the Cantagallo and Campos lines with the northern line into Rio, a length of 40 km., has been proceeded with during the year, and will, it is estimated, be opened for traffic in the course of the year 1922. By this route it will be possible for traffic to be taken direct by rail to the Rio terminus, instead of being ferried across the bay from Nictheroy to Ponta do Cajú, and thence over the Rio d'Ouro line to the junction at Triagem as at present. It is anticipated that a considerable saving in the cost of transport will be effected.

* * *

FROM Peking comes the information that the Ministry of Communications has notified the Chinese delegate to the International Communications Conference, that China earnestly welcomes foreign assistance in the development of her railways. The Chinese delegate is also instructed to emphasise China's strong opposition to international control of any Chinese railway.

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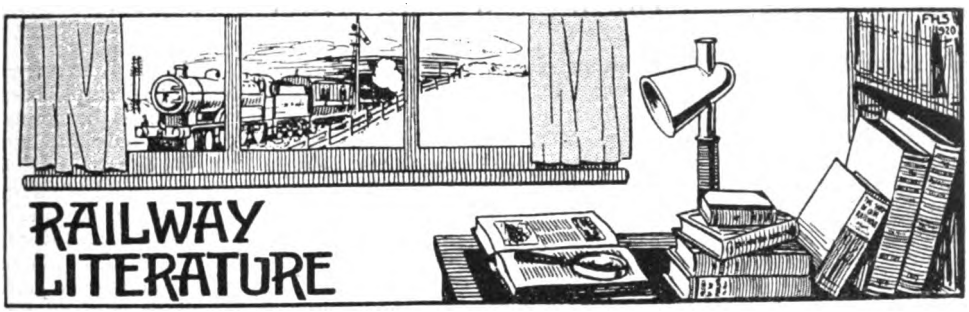

THE WONDER BOOK OF RAILWAYS. Edited by Harry Golding. [Ward, Lock & Co. Limited.] Price 6*s*. net Wherever the English language is spoken the Ward Lock Wonder Books enjoy an extraordinary vogue, and among the rising generation the work relating to railways is deservedly popular. An entirely new edition has just been published. It is the ninth and it is replete with excellent illustrations These include 12 colour plates and nearly 300 photographic reproductions. From its first chapter entitled "What makes the engine go?" to the last under the caption of "Electric Railways"—there are 45 chapters in all—the book is full of rare and entertaining reading matter for all who desire to acquire information concerning the ins and outs of railway working. The aim of the Editor evidently has been to produce a book attractive in appearance, and at the same time instructive. The male parent possessing but a limited knowledge of railway working, and who frequently is called upon by his young hopefuls to furnish facts upon such subjects as steam locomotives or electric traction will be well-advised if he secures a copy of the wonder book primarily. of course, for the benefit of his ever inquiring progeny, but secondly for his own edification and information. For the benefit of such, the book is stocked at the offices of the RAILWAY MAGAZINE. The price by post is 7*s*.

GOLF AT GLENEAGLES. By R. J. Maclennan. Published on behalf of the Caledonian Railway, the claim that this is a unique publication will certainly not be contested. The volume is beautifully produced on art paper, and the hundreds of illustrations are emphasised by a most effective combination of black with the prevailing green used for most of the photographic views. The covers, back and front, bear the Gleneagles crest in colour on a blue ground, with the motto "Heich abune the Heich." Every page is artistically framed, while the text, which abounds with quotations, poetic extracts, &c., is admirably selected. Alliterative play is made with the letter "P" in the titles given to the various sections. The Phantasy, the Prospect (with a view of the Grampian corridor express), the Prelude, the Place, the Precedent, the Problem, the Pæan, the Plan, the Play, the Poesy, the Pilgrimage (on routes to Gleneagles, with views of the station), the Professional and the Postscript (including reference to the Gleneagles Hotel as it is, and as it will be). Pictorial plans of each hole, with their fancy titles, such as the "Witches' Bowster," the "Hinny Mune," the "Queen's Hame," &c., appear here and there, while a complete plan of the course is given as a folding plate. We cannot imagine any golf enthusiast who will be satisfied unless he is the possessor of a copy of "Golf at Gleneagles," and this must be followed by a visit to the famous course, while not a few readers who appreciate an exceptionally high standard of artistic production will treasure this volume, whether they are interested in golf or not. Application for copies should be made to the Superintendent of the Line, Caledonian Railway, Glasgow.

THE "TIMES" CONTOUR ROAD MAPS. [Price 8*s*. 6*d*. each, mounted on cloth. Geographia Limited, 55, Fleet Street, E.C.]. These excellent maps are published in ten sheets on the scale of three miles to the inch. Each sheet measures 31 × 46. They have several special features, such as the classification of the road information and the marking of distances along the roads in prominent blue figures. Steep gradients and speed limits are also clearly shown in colours, and a large amount of information is given of the kind that is really useful to the motorist. Each sheet covers about 10,000 square miles, but though crowded with names the lettering is unusually distinct. The sheets, of course, overlap slightly at the edges. Altogether, considering the scale, it is the best motor map we have come across.

THE LAST WORD IN STEAM-OPERATED SUBURBAN TRAIN SERVICES. [The "Railway Gazette," Price 3*s*. net.]. This is a reprint of a special article published by our contemporary on October 1, 1920, describing the engineering, signalling and traffic methods whereby the Great Eastern Railway had been able to increase its Enfield and Chingford line suburban train services by from

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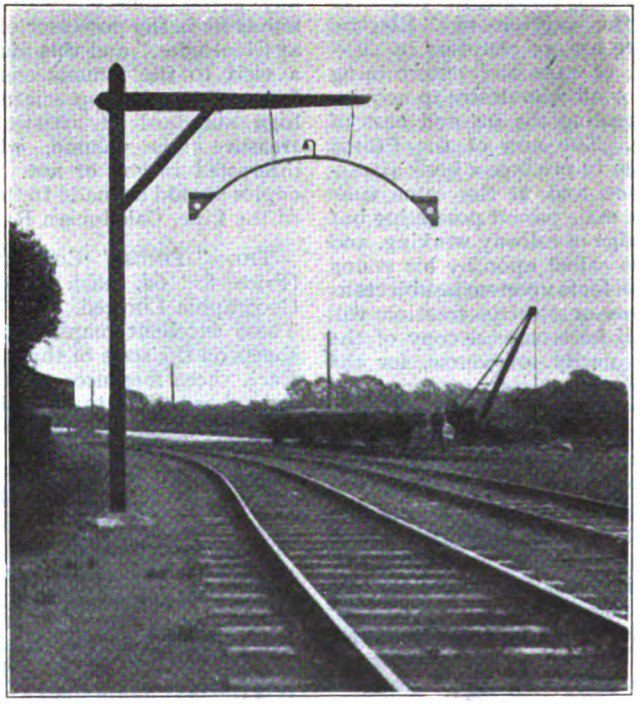
50 to 75 per cent., without either electrification or automatic signalling. It constituted, in fact, a record of the most scientifically-solved train-operating problem of its kind so far achieved, and it is not surprising that the widespread interest created has called for this reprint. Neatly bound, well-printed, and including all plans, diagrams and photographic reproductions, this brochure is now presented in a form convenient for individual reference. Copies may be obtained at THE RAILWAY MAGAZINE Office at published price, or by post 3*s.* 3*d.*

PNEUMATIC CONVEYING. By F. C. Phillips. [Sir Isaac Pitman and Sons Limited. Price 2*s.* 6*d.* net.] This addition to Pitman's series of Technical Primers deals with an aspect of conveying, particularly in reference to loading and unloading of ships, barges, railway wagons, &c., which is becoming of increasing importance, not only for lighter granular materials, but also for the conveying and elevating of heavy solid materials, which receive special reference in this volume. In ten chapters details of plant and equipment, grain and coal-handling installations, induction conveyors, steam jet conveyors and miscellaneous applications are concisely covered. Portable pneumatic plants mounted on railway wagons are described; also suction cleaning for railway carriage upholstery. A comprehensive bibliography and index conclude a useful volume.

A "SAFETY FIRST" LOADING GAUGE.



THE Engineering Department of the London & North Western Railway recently offered prizes for suggestions of practical value. One of these, which has since been adopted, is illustrated. It was designed by Shop Foreman Billing, of Watford, in order to minimise the risk of injury to drivers when running near loading gauges. Owing to the cabs of the larger types of engines being very high, there was considerable danger of accident with the solid ends in the more usual type, but this is largely avoided by the type of gauge illustrated, which has hinged ends of some flexible material, such as cork linoleum.

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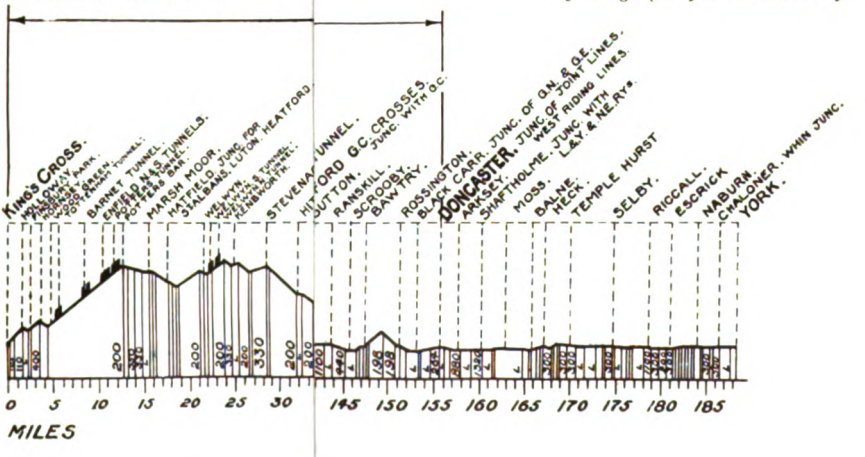
THE RAILWAY MAGAZINE. [*Photograph by F. E. Mackay.*


KING'S CROSS.
HOLLOWAY.
FINSBURY PARK.
HORNSEY.
WOOD GREEN.
BARNET TUNNEL.
ENFIELD W.S.J.C.
POTTERS BAR.
MARSH MOOR.
HATFIELD.
JUNC. FOR ST ALBANS, LUTON, HEATFORD.
WELWYN & TUNNEL.
WELWYN N. TUNNEL.
KNEBWORTH.
STEVENAGE TUNNEL.
HITCHIN.
HITCHIN G.C. CROSSES.
JUNC. WITH G.C.
SANDY.
SUTTON.
RANSKILL.
SCROOBY.
BAWTRY.
ROSSINGTON.
BLACK CARR JUNC. OF G.N. & G.E. JOINT LINES.
DONCASTER.
JUNC. OF WEST RIDING LINES.
ARKSEY.
SHAFTHOLME.
JUNC. WITH L.&Y. & N.E.R^s.
MOSS.
BALNE.
HECK.
TEMPLE HURST.
SELBY.
RIGGALL.
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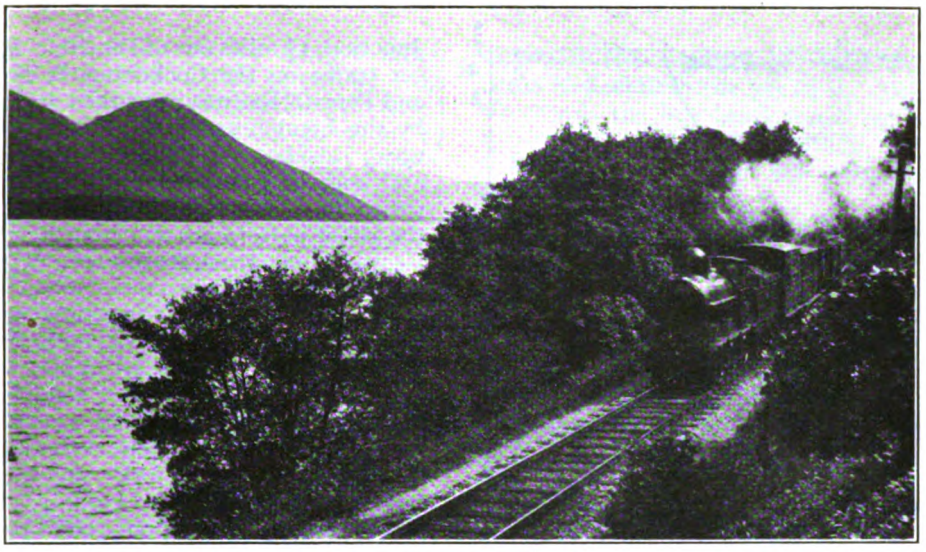

Photo.] ON THE SHORE OF BASSENTHWAITE LAKE. [*Reed, Penrith.*

Skiddaw, 3,054 ft., to left, and Helvellyn, 3,118 ft., in far background.

The Cockermouth, Keswick & Penrith Railway.

By "VOYAGEUR."

IF ever a standard gauge railway in these islands could lay claim to the title of "scenic railway," it is the line which forms the subject of our present consideration. "Super-scenic" is, perhaps, a better term, as it would be impossible, within the brief compass of 30 miles, to find any other British railway traversing so great a variety of wild moorland and mountain scenery, skirting placid lakes and threading its way in company with a rushing river, through a deep gorge, crossing fertile lowlands and affording extensive and constantly-changing prospects along almost every mile of its course. Little-known, perhaps, in that it possesses no locomotives or rolling-stock of its own, the working being undertaken by powerful neighbours—the London and North Western and North Eastern Railways—the Cockermouth, Keswick and Penrith Railway is deserving of description in the pages of the RAILWAY MAGAZINE, ere its identity is finally lost by being swallowed up in the capacious maw of the "North Western and Midland Group."

It is from the Penrith end of the line that most visitors to the district make its acquaintance, Penrith being a well-known junction on the London and North Western main line, 17¾ miles south of Carlisle. The North Eastern Company obtains access to Cockermouth, Keswick and Penrith metals by its trans-Pennine branch from Darlington over Stainmore summit to Kirkby Stephen, and thence via Appleby to Clifton Junction, 3¼ miles south of Penrith. From here North Eastern Railway passenger trains exercise running powers over the London and North Western Railway into Penrith Station, but mineral trains diverge to the west at Eamont Bridge Junction, a mile short of Penrith, and by means of a short double-line spur, a mile long, entirely detached from, but the property of, the North Eastern Railway, pass in a north-westerly direction under the Cockermouth, Keswick and Penrith line, and join it at Redhills

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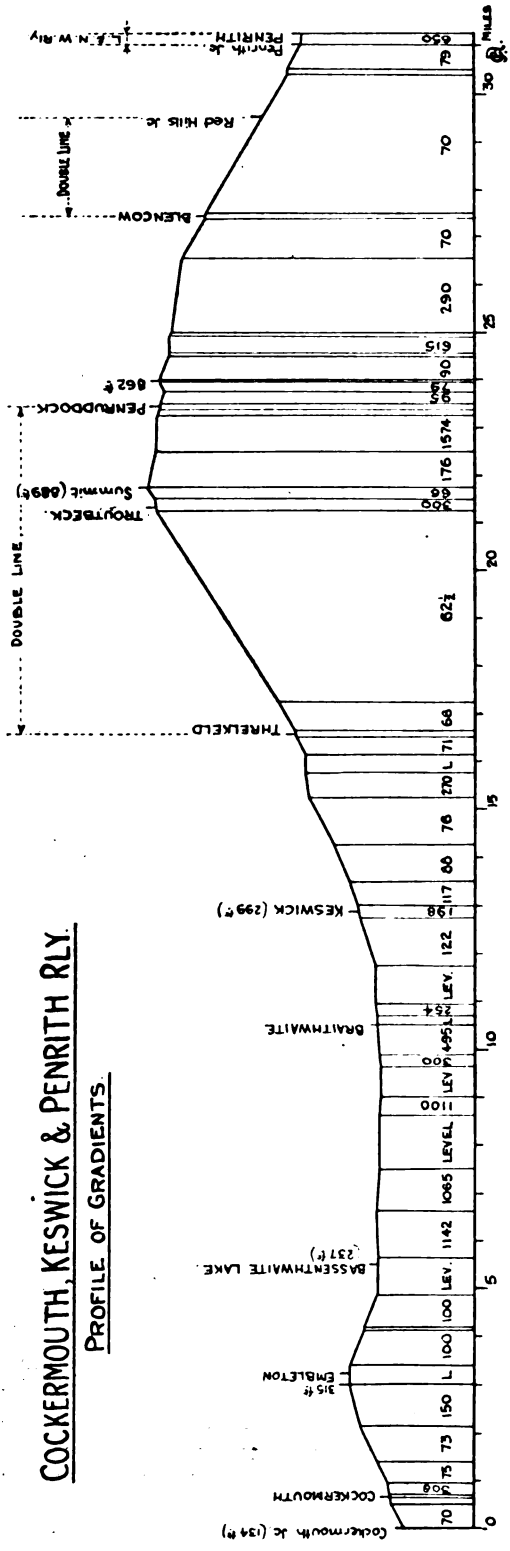

Junction, 1¾ miles out of Penrith. Passenger traffic on the Cockermouth, Keswick and Penrith Railway is worked exclusively by the London and North Western Railway; coaches are mainly of six-wheeled and bogie non-corridor types, but during the summer through corridor vehicles of the latest pattern are run from London to Keswick, and from there on to Workington and Whitehaven.

Motive power was at one time supplied largely by 2-4-2 and 0-6-2 tank engines, but passenger trains are now worked principally by "DX" or "Cauliflower" 0-6-0 tender locomotives, or 2-4-0 express engines. Weight restrictions on account of underline bridgework prevent any heavier type being used. Passenger trains, after reaching Cockermouth, continue their journey over the London and North Western West Cumberland lines to Whitehaven. Mineral traffic over the Cockermouth, Keswick and Penrith Railway was at one time very heavy, as the extensive blast furnace plants of West Cumberland, drawing their hematite iron ore from the rich seams which extend all the way down this coast, required large supplies of coke for smelting purposes from north-eastern England. Since the development of the West Cumberland coalfield, however, a number of the pits have been acquired by the local iron and steel "combine," and equipped with modern coking plants, with the result that the Cockermouth, Keswick and Penrith coke traffic has now diminished to two trains in each direction per day. These are worked through by the North Eastern Railway, with small-boilered 0-6-0 tender engines, the local goods and mineral traffic being operated by the London and North Western Railway.

At Penrith the passenger trains for the Keswick line will generally be found in the back platform line on the down side, whence they are able to start without fouling the North Western main line, and for the sake of any readers who are unfamiliar with the Cockermouth, Keswick and Penrith Railway, we cannot do better than make a journey over it. Leaving Penrith, we diverge at the junction ¼-mile south of the station on to a single line, worked (as are all the single-line sections), on Tyer's block tablet system, and begin steadily to rise at grades mostly about

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1 in 70 in steepness for some 6 miles. In the early part of this ascent we cross the North Eastern spur previously referred to, and join it at Redhills Junction, 1¾ miles out, where the line becomes double. Our direction is now north-westerly to Blencow, the first station (3¾ miles), prominent features in the scenery as we continue to rise being the depression in which lies Ullswater, with its encircling mountains, on the left, and the long range of the Pennines on the right, dominated by Cross Fell (2,930 ft.).

Blencow is a typical two-platform wayside station, with a goods reception road at the back of the up platform; with the Helvellyn range, seen behind Great Mell Fell, to the left of it. Shortly afterwards the line bears round again to a west-south-westerly direction, which is maintained more or less consistently as far as Keswick.

The next station reached is Penruddock, 7¾ miles from Penrith, where double line is resumed. Between Blencow and Penruddock, also, we pass two sidings, both on the down side, the first serving Flusco Quarry, the property of the Cockermouth, Keswick and Penrith Railway, and the original source of supply of limestone for track ballasting and other purposes, and the second Messrs. Harrison's lime works.

Photo.] **KESWICK STATION.** [*Reed, Penrith.*

Looking towards Penrith.

incidentally we are impressed with the enterprise of the management by noticing that at this, as at all the other stations except Keswick and Cockermouth, acetylene gas plants have been installed for station illumination purposes. Keswick, however, is lit by electricity, and Cockermouth by gas.

After Blencow the line again becomes single, and sweeps round by a wide "encircling movement," in order to reach higher ground, until for a short distance it is actually running due south. The view here on the right side of the train is magnificent, the striking outline of Saddleback (2,847 ft.) being the dominant feature, These sidings, as well as the Briery siding, near Keswick, and the Close Quarry siding at Embleton, although not controlled by signal-boxes, can only be unlocked and opened by the use of the train tablet. On leaving Penruddock the line is still rising gradually, and continues to do so as far as the overbridge near Troutbeck down distant signal, 9½ miles from Penrith, which is the summit of the railway. The altitude is 889 ft. above the sea, or only 26 ft. less than the redoubted Shap summit on the neighbouring London and North Western Railway.

Immediately afterwards we reach Troutbeck station, 10 miles from Penrith,

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from which a fair road runs over desolate moorland down to the centre of Ullswater. On the left of the line the conical form of Great Mell Fell, although only 1,760 ft. high, fills the landscape, but when we have passed it the Helvellyn range comes into full view. At the right-hand end, nearest the railway, is the cone of White Pike (2,380 ft.); then, behind that, we see the rounded top of Great Dodd, 2,807 ft.—always a great source of attraction for snow in the winter-time—and, back of that, Helvellyn itself, 3,118 ft. high. At the same time the scree-strewn slopes of Saddleback, or Blencathra, are drawing constantly nearer on the right-hand side of the railway, as we rapidly run downwards toward Keswick. This is much the steepest gradient on the railway, as for 6 miles continuously the line is inclined almost entirely at from 1 in 70 to as much as 1 in 62½; there is, indeed, a drop of no less than 590 ft. in the 9 miles from Troutbeck Summit to Keswick. On the descent we pass Highgate platform, used principally by school children on their way to and from Keswick, and shortly afterwards cross Mosedale Viaduct. The latter is the largest structure of its kind on the railway; it is built of local stone, and has 12 arches of 30 ft. span, the total length being 404 ft.

As we skirt the end of the Helvellyn ridge, on the left-hand, we notice the extensive quarries and plant of the Threlkeld Granite Company; the felspathic granite quarried in considerable quantities forms a large proportion of the freight now carried by the railway company, and the granite dust or chippings are made up into flags for paving purposes. When we reach Threlkeld, 14¾ miles, where the double line again contracts to single, the St. John's Vale is opening up to the left of us, but ahead there appears to be no path suitable for the railway. The next 3½ miles to Keswick, again for the most part falling steeply, are, however, among the finest on the journey from the scenic standpoint. After we have first crossed the Glenderamackin, which drains the slopes of Saddleback, this stream joins the Greta, coming down from Thirlmere and St. John's Vale, and in to the miniature canyon which the latter has hollowed out down to Keswick.

The sides of this gorge are thickly wooded, and the railway passes from one side to the other with many curves and twists, crossing the Greta no less than eight times. Most of these bridges are single bowstring girder spans of considerable size, the biggest being a skew span of 120 ft.; in addition the line passes through two short rock tunnels. As we cross the Greta for the last time, we come out into the open valley in which Derwentwater lies, with the town of Keswick on our left, and the wooded eminence known as Latrigg on the right. Behind the latter comes into view the noble shape of Skiddaw, 3,054 ft. high.

The merits of Keswick as a holiday centre are too well-known to need any description. In its yearly history the busiest time, of course, is that of the annual Convention of Evangelical Christians of all denominations, which is held during the month of July. The latter was founded in 1875 by Canon Battersby, then Vicar of St. John's Church, and has by now attained such popularity that throughout its duration the town is packed, and all accommodation for miles around is at a premium. In pre-war years, the special Convention arrangements made included the running of two through luncheon car expresses from Euston, but since the war, it has not for the present been found possible to resume these facilities. Special through running to and from Keswick, other than the London trains previously referred to, was in force from various popular centres before the war throughout each summer; through London and North Western coaches were worked from Liverpool and Manchester; and during the season the Midland Company ran an express between Leeds and Bradford and Keswick, via Hellifield and Ingleton, from which point London and North Western metals were traversed to Tebay and Penrith. Through coaches from York and Newcastle were also worked off North Eastern trains to Keswick in the summer, via Darlington and Penrith. Doubtless in the course of time these convenient services will reappear. The only "foreign" working at present seen regularly at Keswick is that of the Maryport and Carlisle Railway, which daily operates a morning train from Cockermouth to Keswick, returning at 9.45 a.m. as a through train

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to Carlisle, via Cockermouth, Bullgill and Wigton. Strangely enough, the "train" invariably consists of one composite corridor coach of the latest and most palatial London and North Western type, lettered "on loan to Maryport and Carlisle Railway." This is an all-the-year-round service.

Keswick station, as is evident from the photograph reproduced, is a commodious structure, with wide platforms well roofed over. The up platform is an "island," with through roads on both sides, so that the accommodation consists of three through platforms, with up and down dock platforms in addition; these are connected by means of a subway, which leads out to exits on both sides of the station. There is ample goods accommodation at the west end, and the signalling is controlled by cabins at both ends of the station. The first floor of the buildings on the down side form the offices of the company, and connected to the down platform by a covered way on the same side is the well-known Keswick Hotel. This hotel is not the property of the railway, although the two work in close connection.

Resuming our journey from Keswick, we pass again on to single line, which now continues throughout to Cockermouth, all the intermediate stations being tablet stations, and with the exception of Braithwaite and Embleton, passing places also. After we have passed Crosthwaite Church on the left, we get a fine view up Borrowdale, on the same side, closed at the far end by the mass of Scawfell, 3,210 ft.; in the foreground momentary glimpses are obtained of Derwentwater, and we shortly cross the Derwent, which has now absorbed the Greta, in addition to draining the last-mentioned lake. The writer would hesitate to dogmatise on any matter so notoriously the subject of controversy as the relative beauty of scenery, but in his humble opinion the view which now opens to the left of the train, of the mountains of all shapes and sizes fantastically grouped round the Vale of Newlands and the Whinlatter Pass, is one of the finest mountain prospects this country offers. At the same time Skiddaw is constantly drawing nearer on the right, together with Bassenthwaite Lake, which separates us from the latter mountain. Well before reaching the lake, however, we stop at Braithwaite, 20¾ miles, where the line makes a right-angled bend to the north-west, in order to make its exit from the Keswick Valley by the Bassenth-

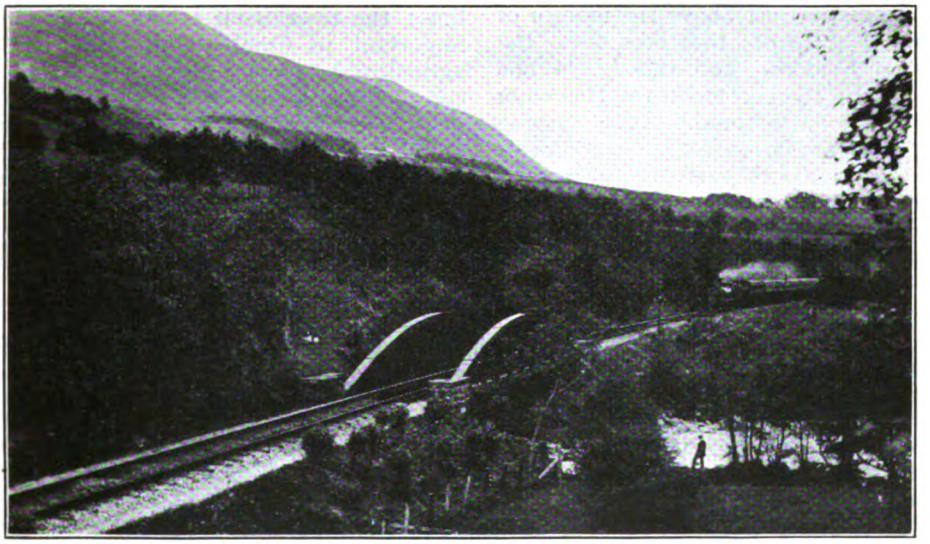

Photo.] **WHITE MOSS BRIDGE, OVER THE GRETA.** [*Reed, Penrith.*

Saddleback, 2,847 ft., in the background.

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waite gap. Braithwaite station has a single platform only, and, though passenger trains cannot be crossed here, refuge siding accommodation is provided in order that a passenger train may pass a goods train if required.

Shortly after leaving Braithwaite we pass the workings of a lead mine on the left; in this connection it may be said that the staple industry of Keswick is that of making lead pencils. The whole district contains mineral deposits of almost unique variety, but in most cases of too small extent to be worked profitably. As we approach the lake, the mountains close in on the left, and for the next 3 miles the railway pursues a charming course along the steep and well-wooded hillside, just above the margin of the water. Across the lake lies the *massif* of Skiddaw, and there is a fine retrospect up the lake, with the Helvellyn range in the background. Again turning a right-angle, in order to resume our west-south-westerly course, we run into Bassenthwaite Lake station, 25¾ miles. This is the centre of another favourite holiday district, and in addition a considerable amount of felled timber is dealt with in the goods yard.

We now pass into the valley of the Derwent, shortly noticing up the hillside on the right the large Close Quarry granite workings, with their inclined railway. On the top of the ridge above the quarry is situated the Embleton golf course—one of the most elevated in the country, with magnificent prospects in every direction. Embleton station (28 miles), like Braithwaite, has one platform for up and down passenger trains, and a refuge siding into which goods trains may be shunted if necessary. The line has been rising fairly steeply in parts from Bassenthwaite, but now falls again, with 1½ miles at 1 in 74; as we run rapidly down this incline the wide Vale of Lorton opens up on the left of us, backed by the round summit of Grasmoor, 2,791 ft. In the valleys at the head of this vale lie three well-known lakes—Loweswater, Crummock Water and Buttermere—and the rushing Cocker, which drains them all, we cross by a two-span girder bridge, 130 ft. long, just before running into Cockermouth. Cockermouth derives its name from the confluence of the Cocker and the Derwent, and from there to the sea the latter carries away the surplus water from six large lakes, and all their surrounding areas—probably the largest area, indeed, that is drained by one single river in the whole of the English Lake district. Needless to say, these rivers are subject to flooding at times of exceptional rainfall, and Cockermouth suffers periodically on this account; the railway authorities are not immune from anxiety from the same cause, either, especially as regards the stretch of line between Keswick and Braithwaite, where Derwentwater and Bassenthwaite are at such times transformed into one continuous sheet of water.

Cockermouth station is 30¾ miles from Penrith, and is the second largest on the line; the town itself is one of the most important in Cumberland, and a great agricultural centre. For this reason a considerable quantity of cattle traffic is dealt with here in special sidings, with ample accommodation. The passenger station has three platforms, the down platform being an "island" connected with the up side by a subway; the passenger train service consists of the Cockermouth, Keswick and Penrith trains, which, as previously mentioned, are extended over the London and North Western Railway to form the local service between Cockermouth, Workington and Whitehaven, and also the local Maryport and Carlisle service between Cockermouth, Bullgill and Maryport, which uses London and North Western metals as far as Brigham, 2¼ miles distant. The latter branch working is undertaken almost exclusively by the one and only Maryport and Carlisle 0-4-4 tank engine, in company with the corridor London and North Western coach previously mentioned. Station buildings at Cockermouth, which is in reality a joint London and North Western and Cockermouth, Keswick and Penrith station, include a refreshment and tea room; and on the south side of the line carriage-sheds are provided for the cleaning and storage of passenger rolling-stock. The end—or strictly speaking, the beginning—of the Cockermouth, Keswick and Penrith Railway is reached ¼-mile beyond the station, down a descending grade of 1 in 70, an end-on junction being effected with the double line of the London and North Western Railway at

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Cockermouth Junction. This connecting link is also single line, and for part of the distance is carried on a low stone viaduct of 12 spans, 222 ft. long. The total length of the railway is actually 30 miles, 65 chains; including sidings and reduced to single track the aggregate figure is 49 miles, 16 chains. In this length there are 135 bridges either over or under the railway.

The winter working time-table, which operates for the major part of the year, shows a total of six passenger trains daily in each direction between Penrith and Cockermouth Junction. In addition there is the Maryport and Carlisle working previously referred to between Keswick and Cockermouth; and six Maryport and Carlisle passenger trains daily run to and fro between Cockermouth Station and Junction. There are also one or two local London and North Western workings into and out of Cockermouth Station. In connection with the Threlkeld quarries, a workmen's train runs daily one trip in each direction between Keswick and Threlkeld. The total number of passengers booked last year, excluding season ticket holders, was 361,526; in 1913, the last normal year, it was 482,006. As regards goods and mineral traffic, in the ordinary course, two goods trains daily, for station-to-station traffic, are worked in each direction between Cockermouth and Penrith by London and North Western engines, and two through coal and coke trains, or empties, by the North Eastern Railway. In addition there are one or two local workings by London and North Western between Keswick, Threlkeld and Troutbeck. The heavier freight trains require assistance in rear from Keswick or Penrith as the case may be, to Troutbeck Summit.

In conclusion, a few words concerning the history of the line may be of interest. It was incorporated on August 1, 1861, the Act providing for arrangements to be made with the London and North Western and Cockermouth and Workington Railways for the use of stations at each end, and fixing the capital at £200,000, with £66,000 on loan. By an Act of June 29, 1863, several new works were authorised. Towards the undertaking the London and North Western and the Stockton and Darlington (now North Eastern) Railways were allowed to subscribe £25,000 each, and also to enter into working agreements, the terms of which, when subsequently fixed, provided for the working of the traffic in perpetuity, in consideration of a return of 33⅓ per cent. of the receipts for passengers and goods, and 35 per cent. of those for minerals. The percentage on coaching traffic was

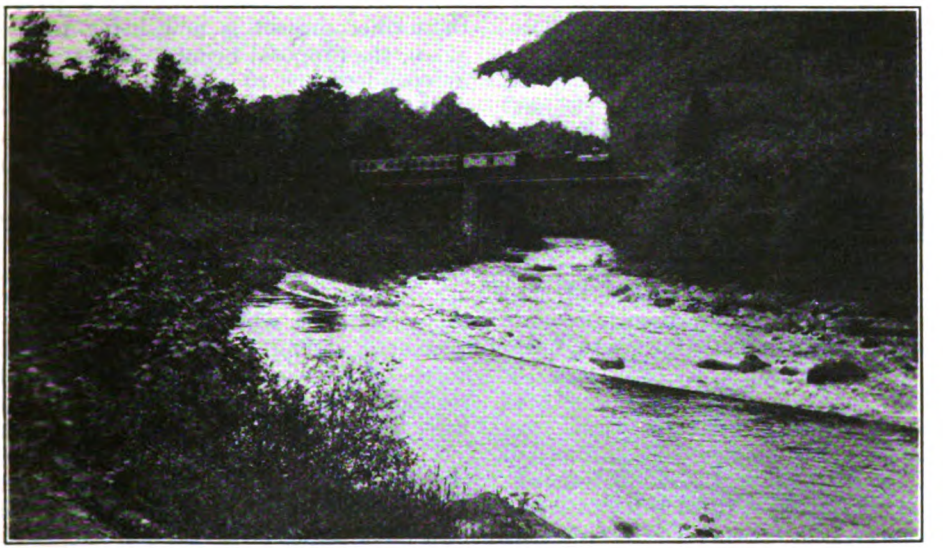

Photo.] [*Reed, Penrith.*

LOW PEARSON BRIDGE, OVER THE GRETA, NEAR BRIERY BOBBIN MILL.

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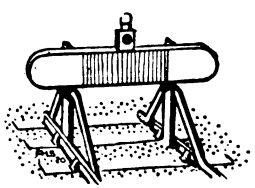
also increased to 35 per cent. on January 1, 1889. Both the two railways mentioned are represented on the board of directors of the Cockermouth, Keswick and Penrith Railway, by two directors each, out of a total of 12.

The contract for construction was let to Boulton & Sons, of Newcastle-on-Tyne, the contract figure being £267,000; the necessary land cost about £1,500 per mile. Mr. Hoskins, then Chairman of the company, cut the first sod in May, 1862, and the line was opened for traffic on January 2, 1865, less than three years later. It was at first single line throughout, the doubling of the Threlkeld-Penruddock and Blencow-Redhills Junction sections having been undertaken at a later date. In 1865, the company was authorised to raise £34,000 additional share capital, and to borrow on mortgage £11,000, and by another certificate of the Board of Trade two years later, the share capital was increased by £25,000, and the borrowing powers by £8,000. This £25,000 was issued in 5 per cent. preference shares. A precisely similar increase of share capital (£25,000) and borrowing powers (£8,000), was authorised in 1876 by Board of Trade certificate, and by the Cockermouth, Keswick and Penrith Railway Act, of 1894, an addition of £51,000 in stocks and shares, and £17,000 in loans was sanctioned. This makes a total authorised capital of £335,000 in stock and shares, and £117,000 in loans or debenture stock, of which £332,479 and £90,132 respectively have been issued. All the shares of the company then existing were, in August, 1882, converted into consolidated stock. On the ordinary stock of the company a dividend of 2½ per cent. per annum has been paid for some years past.

It is probably well-known that various rival routes into Keswick have at one time or another been proposed. An extension of the London and North Western Windermere branch has been projected past Ambleside, Grasmere and Thirlmere, and at another period surveys were made by the Midland Company, in conjunction with the Furness Railway, for a route from the south-west, up Eskdale, then tunnelling under Esk Hause, and so into Borrowdale and Keswick. But more than mere summer tourist traffic was necessary in order to render profitable in working such expensive projects, and the lines never materialised. As mentioned in the July RAILWAY MAGAZINE, however, a part of the former project is now being revived again, the proposal being to construct an independent line 16 miles in length, from Ambleside to Keswick, at a cost of £150,000, and to work it by means of petrol-electric engines of a special design, which would overcome objections on the score of the smoke and noise occasioned by a steam railway. Even the present Cockermouth, Keswick and Penrith Railway incorporates portions of three proposed routes, one of which varied from that ultimately adopted by running to the north of Keswick instead of the south, another taking the Skiddaw side of Bassenthwaite Lake, while the third did not terminate at Penrith at all, but struck across past Pooley Bridge, at the lower end of Ullswater, and from there to a junction with the London and North Western main line near Clifton. My thanks are due to Mr. J. Clark, the General Manager and Secretary of the railway, for his courtesy in furnishing much of the statistical and other information contained in this article.



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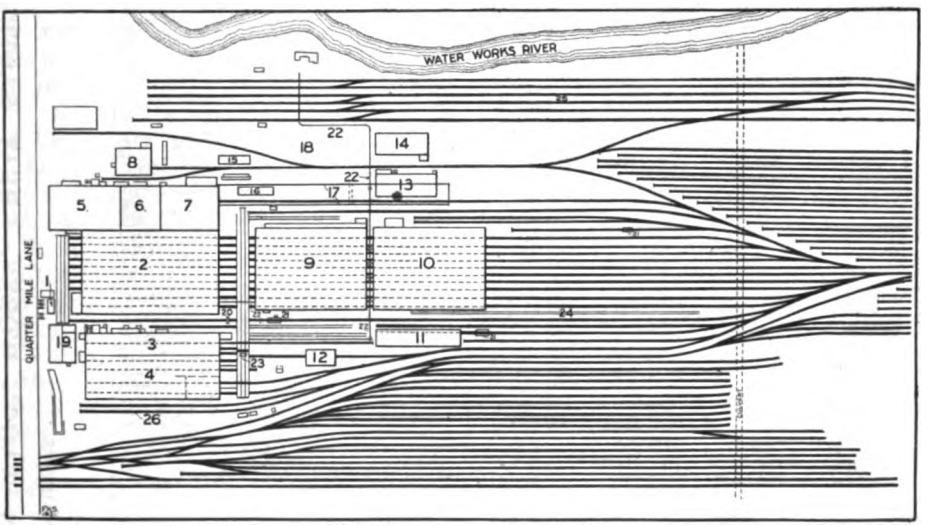
Temple Mills Wagon Works, Great Eastern Railway.

By J. F. GAIRNS, M.I.Loco.E.

IN the July RAILWAY MAGAZINE, the Great Eastern Railway works at Stratford were described. Such reference would, however, be incomplete without an account of the works at Temple Mills, about ¾-mile from Stratford towards Lea Bridge, between the Cambridge line and the River Lea, and in line with the great sorting and marshalling yards known to the Traffic Department as Temple Mills.



PLAN OF TEMPLE MILLS WAGON WORKS.

1—Gate house. 2—Wagon erecting shop. 3—Wheel shop. 4—Steel frame shop. 5—Smithy. 6—Machine shop. 7—Saw mill. 8—Stores. 9, 10—Light repair sheds. 11—Steel underframe stores. 12—Hydraulic straightening shop. 13—Erith (steam) timber drying and seasoning plant. 14—Timber seasoning shed. 15—Paint stores. 16—Frame saw. 17—Timber gantry. 18—Timber yard. 19—Workmen's mess rooms. 20—Hydraulic sheer-legs. 21—Weighbridge. 22—Trolley lines. 23—Electric traverser. 24—Wheel track. 25—"River" light repair roads. 26—Lines for private owners' wagons.

These works were brought into use in 1896, thus releasing valuable space at Stratford for extension of the carriage shops. They cover about 24 acres, and some 800 men are regularly employed. As part of the Chief Mechanical Engineer's Department, Mr. A. J. Hill and his principal assistants have also oversight of the Temple Mills works, but Mr. C. Spencer is directly in charge as Wagon Works Manager. The capacity for which the works are designed is 500 new wagons annually, and repairs to about 500 per week. Light running repairs to private owners' wagons are also dealt with. Work is also done for the Carriage Department at Stratford, steel underframes and bogies being prepared at Temple Mills and transferred to Stratford for the addition of bodies, etc. As a rule, only ordinary types of goods rolling-stock are constructed, but all-steel locomotive coal, well and machinery wagons are built as required.

The works are entered from Quarter Mile Lane, part of a road which crosses Hackney Marshes from Leyton to Old Ford, adjacent to a bridge carrying the lane over the railway. Inside the gates, to the left of the gatehouse, is a cycle

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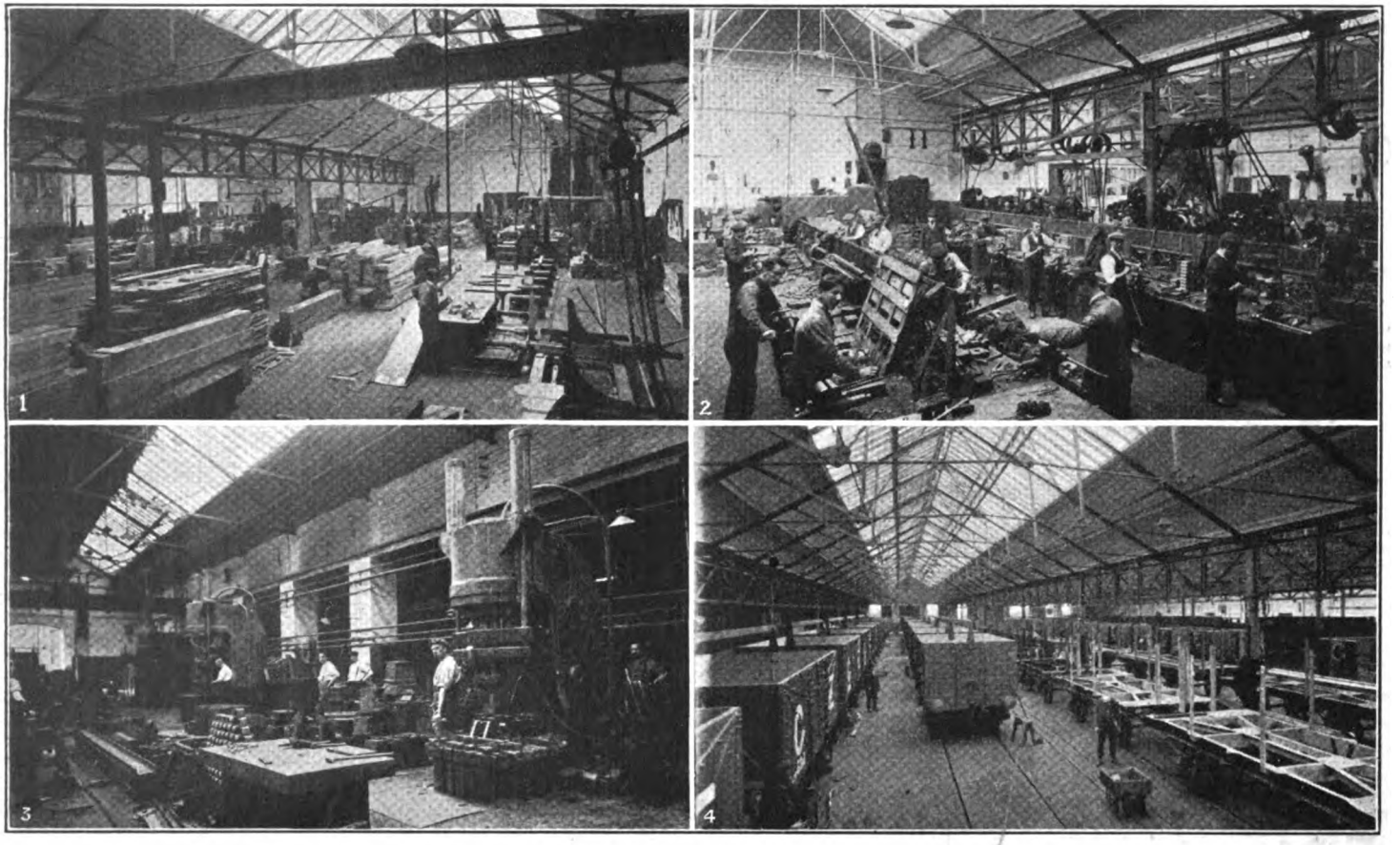

1. SAW MILL.
2. MACHINE SHOP.
3. GROUP OF FORGING MACHINES.
4. WAGON BODY SHOP.

TEMPLE MILLS WAGON WORKS, GREAT EASTERN RAILWAY.

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shed for the use of workmen, and to the right mess and smoking rooms. In front is a large building, the wagon erecting shop, at one corner of which are the offices used by Mr. Spencer and his staff. On the river side of the erecting shop are the smithy, machine shop and saw mill, with a stores building a short distance away, while alongside the railway are the wheel and steel frame shops.

Separated from these premises by an electric traverser (power throughout the shops is obtained from the Stratford power station, using three-phase 440 volts 50 period alternating current), 10 tracks are roofed over, in two lengths, for general and lighter repair work. Near-by is the hydraulic straightening shop, with the underframe store, and a 20-ton weigh-bridge adjacent. Towards the river bank are the main timber seasoning shed and an Erith (steam) timber drying and seasoning plant. Beyond are six " river " roads on which light repairs are executed. Alongside the steel frame shop are two lines reserved for light repairs to private owners' wagons. Throughout the area there is a complete system of railway tracks for the movements of vehicles and for the accommodation of wagons waiting attention or ready to be returned into traffic.

In the wheel shop, 260 ft. by 40 ft., a special feature is the group of four Tweddell hydraulic forging machines, on which a large proportion of wagon parts are made, the dies therefor occupying considerable storage space adjacent. By series of operations relatively complicated work is done with these machines, reducing subsequent machining processes very materially. They are served by coal-fired furnaces, while hydraulic power is obtained from steam driven pumps and an accumulator alongside.

The remainder of the wheel shop justifies its name. Here are wheel and axle lathes, Mansell wheel machinery (in view of the use of such wheels for some classes of goods rolling-stock), and gas-fired tyre furnaces, etc. Air compressors serve pneumatic tools which are used in the adjoining underframe shop and elsewhere. A 3-ton overhead electric crane with floor control serves this shop, and, notwithstanding the general withdrawal of female labour, is usually operated by a woman, the only one still engaged at Temple Mills on shop work. The steel frame shop is 260 ft. long and 80 ft. wide, and has four roads throughout. This section is served by a 5-ton overhead electric crane. Between the wheel and the erecting shops a hydraulic sheerlegs spans the intervening railway track. At the corner of the wheel shop is the works fire station.

In the wagon erecting shop, which is 270 ft. long and 165 ft. wide, there are 10 railway tracks, in four bays. The corrugated iron bay in this building constituted the entire wagon shops when the depot was first erected. The east bay is used for the assembly of timber underframes and for storing prepared material. In the corner are air reservoirs in connection with the pneumatic supply system. In the second bay wagons are painted. The third is partly used for underframe assembly and partly for repairs, while the fourth bay is exclusively devoted to repairs. Usual tools and appliances are provided, but no machining is done.

In the smithy alongside, 140 ft. by 80 ft., are four steam hammers, forges and smiths' hearths, bolt screwing and nut and bolt making machines, and at the end a spring section with appropriate furnaces and appliances. The machine and fitting shop, 76 ft. by 80 ft., includes axle box machinery (drills, planers, slotters, boring machines, etc.), punches, etc., some being mainly employed in making dies for the forging machines in the wheel shop. Lathes placed along the outer wall and fitters' benches complete the equipment.

In the saw mill, 115 ft. by 80 ft., the principal feature is a heavy planer for making sole bars, with morticing and tenoning and drilling machines and circular and band saws. Here suction ducts withdraw sawdust directly from the machines, the exhausting fans and the belting for each machine being placed below the floor. Alongside are small electrical stores, and beyond is a powerful frame saw served by a 40 ft. span timber gantry, 460 ft. long, extending from the saw mill over this saw and over one section of the Erith drying plant, so that large timbers can be manipulated from end to end.

The Erith plant is designed to accelerate

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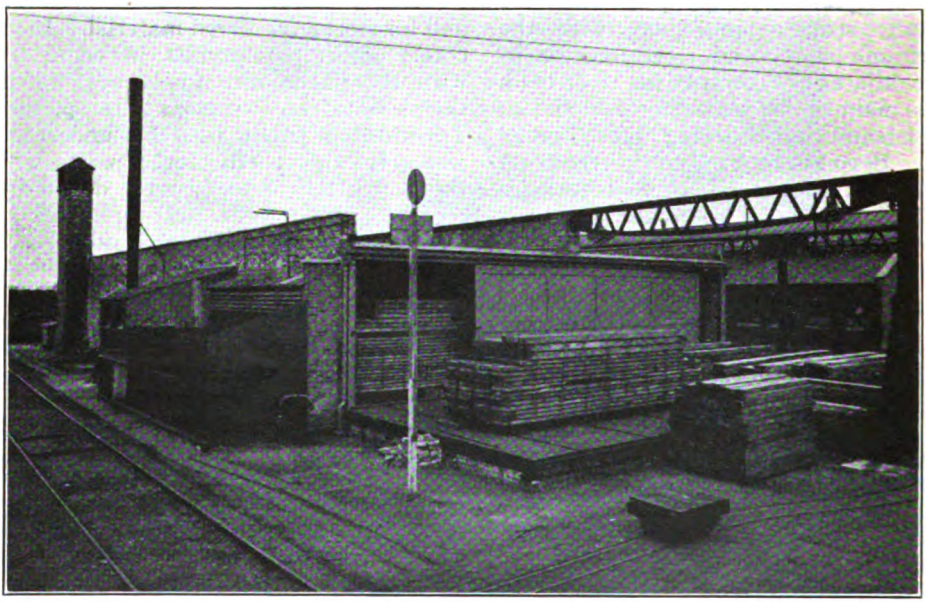
the seasoning of timber, and is found to give very satisfactory results in practice. It is 93 ft. long, in two sections (one of which is under the gantry so that heavy timbers can be manipulated for treatment), each 22 ft. 6 in. wide. Sliding doors at each end enable wood for treatment, piled on small trolleys running on rails, to be inserted at one end and thence traversed forward in stages to the other end for exit. A system of steam pipes runs throughout the plant, steam being supplied from a locomotive boiler alongside at a pressure of 50–60 lbs. per sq. in., with control valves, steam traps, etc.,

ting pads are treated and cleaned. A bosh for cleaning axle boxes is also provided. The hydraulic frame-straightening machine and various stores and other buildings hardly need detail description. The "wait repair" sidings beyond will accommodate 1,000 wagons.

This article may be fittingly concluded by a brief review of the rolling-stock in use on the Great Eastern Railway, and for the construction and maintenance of which the Chief Mechanical Engineer's Department is responsible. Portraits are also given of several of the Chief Assistants



ERITH (STEAM) TIMBER DRYING PLANT, TEMPLE MILLS WAGON WORKS.

in a basement adjacent. A uniform humid atmosphere is thus maintained, and, as a rule, 14 days' treatment suffices to render the timber well seasoned and cured for use. This plant does not, however, entirely supersede natural seasoning, which is carried on in a large timber shed adjacent. At one corner of this shed is a powerful electric cross-cut pendulum saw.

The 10 tracks included in the roofed-over yard are used for all kinds of repairs. There are six bays, and the sides are closed, though the ends are open. On one side is a shed where oil is extracted by a centrifugal separator, and cotton packings cleaned, while in another section lubrica-

in the Chief Mechanical Engineer's Department to complete the personal references given last month.

This company has never been one to include a wide variety of locomotive designs, and a considerable degree of standardisation has been in force for many years; but the wheel-types used for tender locomotives include a number of interesting classes. The "single-driver" has been long extinct, and all of the old 2-4-0 locomotives with 7 ft. coupled wheels which still remain have been rebuilt as 4-4-0's. The total of 100 2-4-0 locomotives now in service therefore consists exclusively of the well-

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known and deservedly famous, though now somewhat out-classed, mixed-traffic series, inaugurated by No. 417. These useful little engines have a surprising turn for speed, despite the moderate size of their coupled wheels, and at one time were frequently employed on main line or long branch services involving a degree of express running. Now, however, they are chiefly found on the duties for which they were primarily designed—branch working and miscellaneous passenger and light goods train operation.

The present total of 171 4-4-0 engines includes 111 of the "Claud Hamilton" class, inaugurated by No. 1900, built in that year and numbered in successive series of 10 backwards to 1790-9. As first built, these engines, some of which were originally fitted for burning oil fuel and have recently been so converted once more to meet the conditions of the coal strike, had round-topped fireboxes, but the last 70 were built with Belpaire fireboxes, and most of the others have been so altered when their turn came for rebuilding. A considerable number of these locomotives are now fitted with superheaters, though retaining the original slide valves. Although to some extent displaced from the principal main line trains, at any rate south of Cambridge and Ipswich, by the 4-6-0 locomotives, they still perform a considerable share of main line duties. On the Southend branch they are given some of the hardest work still carried out by 4-4-0 engines. In conjunction with the 4-4-0 T19 locomotives rebuilt from the 2-4-0 7 ft. class, they also take a share on the many relatively lengthy branch turns.

The principal express class, however, is the "1500" series of 4-6-0 locomotives, which now number 70. Nos. 1541 to 1560 were constructed by Beardmore and Company, the last having been only recently delivered, Stratford having completed Nos. 1561 to 1570. in the interim. These engines now perform the bulk of the heaviest main line duties, particularly between London and Norwich, via Ipswich, and between London and Cambridge, also working the through non-stop trains to Cromer, and occasionally to Yarmouth during the summer season, together with the Continental boat trains to and from Harwich. They are also frequently employed for main line stopping trains, on which work (especially where such trains load heavily, as is not infrequently the case), they have proved most satisfactory. In fact, a usual turn of duty is to work an express one way between London and Ipswich or Cambridge, returning on a heavy stopping train, or *vice versa*.

The goods engines are exclusively of the 0-6-0 type, ranging from the older engines with 4 ft. 11 in. coupled wheels, designed by Messrs. Worsdell and James Holden (some of which rank as mixed traffic locomotives for working excursion and occasionally ordinary passenger trains), to the large mineral engines of the "1150" and succeeding classes. The last of these, one of which was illustrated as a frontispiece to the RAILWAY MAGAZINE for February of this year, rank as the largest 0-6-0 locomotives in the United Kingdom, besides being notable for the fact that they have corresponding boilers to those of the "1500" 4-6-0 class. These locomotives have 4 ft. 11 in. coupled wheels, and are principally engaged on the heavy mineral traffic, though they also take a share in the general goods working. There are also 44 of the War Department 2-8-0 locomotives in use north of March, but these are not included in the Great Eastern stock. The total of 0-6-0 locomotives in use is now 442.

Five tank engine types are in use, the most numerous being the various 0-6-0's. These include those engaged purely in shunting and on local goods traffic, and not fitted with Westinghouse brake equipment; the passenger classes fitted with higher pressure boilers, Westinghouse brake apparatus and condensing equipment, and used principally on the London suburban services on the Chingford, Enfield and Palace Gates routes, though occasionally seen on other duties; the small 0-6-0 engines employed on the Fenchurch Street—Blackwall, Elsenham and Thaxted and Kelvedon and Tollesbury Light Railways, and on some of the smaller country branches; and the more powerful tram engines fitted with enclosing casings for working through the streets of Yarmouth, &c.

The next most numerous class is the 2-4-2, of which there are 235. These include 50 engines of the "1090" class, with 5 ft. 8 in. coupled wheels and generally

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corresponding to the "417" class of mixed-traffic tender locomotives, having been designed by Mr. James Holden for main line duties suited to tank engines. They are now principally employed on country routes radiating from Norwich, Ipswich and Cambridge, though a few of them are still to be seen now and then working up to London. Remaining 2-4-2 engines are principally of the smaller classes, with 5 ft. 4 in. coupled wheels, working in the London district and on various country branches. Those later built have bell-topped, brass-rimmed chimneys and side window cabs, but many of the others have been rebuilt to correspond, except that they retain the older type of cab and frequently the plain chimney also. There are, in addition, the engines of the "1300" class, with 4 ft. 10 in. coupled wheels, designed for light branch traffic. Some of these engines have been fitted for auto-train working.

Remaining suburban traffic tank engines are the 40 of the "1100" class, having the 0-4-4 wheel arrangement and 4 ft. 10 in. coupled wheels, and the "1000" class of 0-6-2 engines. The former are principally employed on the Enfield and Chingford services, in conjunction with the 0-6-0 tank engines, or for passenger train shunting and on local goods traffic. At present there are only the original two engines of the 0-6-2 type, Nos. 1000 and 1001, the latter fitted with superheating apparatus, but several others are now being completed at Stratford Works. The design was introduced to meet the demands of the Enfield and Chingford services, but it was impossible to add to their number during the war, and only now is this urgent need being met.

Fifteen 0-4-0 tank engines are used for yard shunting and about the works, or for tram purposes at Yarmouth, &c. Some of them are small, but the latest series are large and powerful engines for the 0-4-0 wheel arrangement.

Passenger rolling-stock consists of 3,986 vehicles for conveying passengers and 1,728 other coaching vehicles. Of the former total, 3,165 convey one class only; 767 are composites and 54 are restaurant cars. In suburban traffic the modern stock is now entirely bogie, in sets of eight vehicles, varied somewhat in composition

MR. F. DUCE,

Outdoor Assistant to Chief Mechanical Engineer.

MR. J. H. B. JENKINS,

Chief Chemist.

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Photo.] [*Arthur Hands.*

MR. T. O. MEIN,
Assistant Works Manager.

MR. HAYDON PARKER,
Carriage Works Manager.

Photo.] [*W. E. Wright & Sons.*

MR. C. SPENCER,
Wagon Works Manager.

MR. G. CASTER,
In charge of New Engine Repair Shop.

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to suit the different class demands of the respective routes. A considerable number of four-wheeled sets are, however, also in use, these being usually made up to 15 or 16 vehicles, though occasionally 17, 18 and even 20 are conveyed. Six-wheeled coaches are also to be found in suburban sets, as well as on branch lines, but all important trains are now made up of bogie vehicles, frequently self-contained and with semi-corridors to give access to lavatories, but largely as corridor coaches adapted to be vestibuled for use in restaurant car trains as required.

In the suburban area a good proportion of the seating space is for second-class passengers, but, otherwise, first and third-class accommodation only is provided, except on the Continental trains which are first and second-class. The restaurant cars are operated on a wide variety of services including some of a stopping train character, and several on branch routes, as to Southend, Clacton-on-Sea and Walton-on-the-Naze. In fact, it is necessary on the Great Eastern Railway to use the term "restaurant" in preference to "dining" or "luncheon," in that these vehicles are used for serving breakfast, luncheon, tea, dinner or supper, according to the time of travel, while they are also frequently used as centres for the supply of light refreshments through the train. In addition to these, 12 Pullman cars are now operated in Great Eastern trains, by arrangement with the Pullman Car Company. Both first and third-class Pullmans are in use, and on the Continental trains first and second, in some instances running in trains which also convey restaurant cars.

Remaining coaching vehicles include 14 post-office vans, used principally on the 8.50 p.m. Ipswich mail and on the 10.12 p.m. Norwich mail from Liverpool Street, via Cambridge, and the return trains. Luggage, parcels and brake vans number 472; carriage trucks, 169; horse boxes, 542; and there are 531 miscellaneous vehicles, including milk vans, motor car vans, fish trucks and other vehicles adapted for being attached to passenger trains.

Among the special vehicles may be mentioned cattle boxes for the conveyance of prize and breeding cattle travelling under the charge of an attendant, and a special design of horse-box for three horses placed longitudinally in compartments side by side, the dividing partitions being adapted for easy dismantlement and erection as required. The full length horizontal and vertical doors render it easier to entrain or detrain fractious animals. Fodder bins are provided in each section, while the grooms have convenient arrangements for oversight and attention to their charges. At the other end is a compartment in which partitions not in use can be placed and for conveying supplies and baggage which may be sent at the same time.

An uncommon item is an elephant van, the first to be employed in the United Kingdom. It was constructed in July, 1912, and has an unusually high roof, 8 ft. 4¼ in. above floor level in the centre. Animals are loaded by means of end doors, side doors being, however, provided for attendants.

For the conveyance of general merchandise traffic 18,507 open wagons, of capacities of from 8 to 12 tons, are in use, together with 164 for loads of from 12 to 20 tons, and 3 of even greater capacity. Gunpowder wagons number 28, while there are 5,309 covered wagons of 10 tons capacity. Cattle trucks number 1,749; rail and timber trucks, 983; and brake vans, 662. There are also four special wagons for loads of exceptional dimensions and weight. For service use there are 48 gas-holder trucks, 2,248 locomotive coal and coke wagons, 503 ballast wagons, 25 mess and tool vans, 12 breakdown cranes, 26 travelling cranes and 137 miscellaneous vehicles.

Among the special vehicles employed for goods traffic or service purposes may be noted the 20-ton steel locomotive coal wagons, the useful 14-ton machine wagon on four wheels, and the standard 40-ton "crocodile" wagon, used for lengthy and specially heavy and unwieldy loads, carried on two four-wheeled bogies, and designed for a distributed load of 40 tons, or 30 tons concentrated in the well, which has a floor only 20 in. above rail level. Loading baulks and special fittings are attached, as required to suit particular loads and conditions.

The department is also concerned with the construction and repair of road vehicles. Of these, six motor passenger

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vehicles are in use, together with 13 used for goods and parcels traffic. There are 27 horse omnibuses, and 1,339 horse wagons and carts.

In Mr. Hill's biography, given last month, it should have been stated that he is a member of the Institution of Civil Engineers, as well as a member of the Institution of Mechanical Engineers; the papers mentioned, for one of which the Miller prize was awarded, and for the other a Watt Medal and a Crampton prize, were read before the former Institution.

LONDON "SAFETY FIRST" COUNCIL.

ESSAY COMPETITION FOR CHILDREN OF RAILWAY EMPLOYEES.

The competition to be known as "The London 'Safety First' Essay Competition for Children of Railway Employees."

Object of the Competition.—To encourage, by the award of prizes and certificates, special interest in "Safety First" principles by children of railway employees.

The Competition to be open to boys and girls under 16 years of age, either of whose parents is employed by a railway company and who resides within 20 miles of Charing Cross.

The subject of the Essay to be "Safety First," and deal with the avoidance of accidents on railways.

Each essay not to exceed 500 words.

If a competitor desires, an *original* sketch, prepared unaided by the essayist, showing how accidents happen or may be avoided, may also be included.

Each essay must be the unaided composition of the competitor, and a certificate to this effect will be required from one of the essayist's parents. Compositions must consist of original matter and be as concise as possible. Quotations, if employed, must be marked with inverted commas. Each page of the essay must be numbered.

When judging essays and sketches, regard will be paid to the ages of the competitors.

Entry Forms can be obtained gratis from the Joint Hon. Secretaries, London "Safety First" Council, 2/3, The Sanctuary, Westminster, S.W.1.

No fee to be payable in respect of the Competition.

Essays, enclosed in envelopes marked in top left-hand corner "Railway Essay," must be sent to the Joint Hon. Secretaries, at the above address, *not later than September* 30, 1921.

Prizes to the value of £20 will be awarded, irrespective of the sex of the essayist, as follows:—First, £3; second, £2; third, £1; 14 at 10s. each and 28 at 5s. each.

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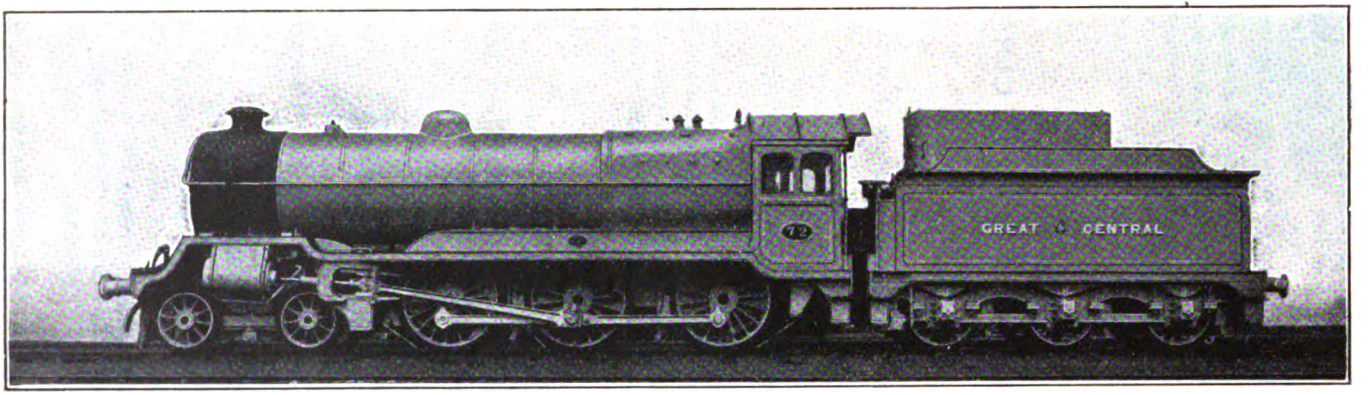
4-6-0 FOUR-CYLINDER EXPRESS GOODS LOCOMOTIVE, GREAT CENTRAL RAILWAY.

Mr. J. G. ROBINSON, C.B.E., Chief Mechanical Engineer.



MR. J. G. ROBINSON, C.B.E., Chief Mechanical Engineer, Great Central Railway, has now placed in service a class of 4-6-0 four-cylinder locomotives, designed for express goods and mixed traffic duties, but corresponding generally with the "Valour" main line passenger class. The engine illustrated is equipped for oil fuel, has the Robinson "front cover" superheater, with circulating and header discharge valves and combined pressure release and piston valves. "Intensifore" lubricators, and usual fittings.

Leading dimensions are: Cylinders (four), 16 in. by 26 in. Coupled wheels., 5 ft. 8 in. diam. Bogie wheels, 3 ft. 6 in., diam. Wheelbase—coupled, 14 ft. 5 in.; engine, 28 ft. 3 in., engine and tender, 52 ft. 9½ in. Total length over buffers 63 ft. ¾ in. Working steam pressure, 180 lb per sq. in. Heating surface—firebox, 163 sq. ft.; large tubes, 678 sq. ft.; small tubes, 1,203 sq. ft.; superheater 343 sq. ft.; total, 2,387 sq. ft. Grate area, 26 sq. ft. Tender: fuel capacity, 6 tons of coal or 1,215 gallons of oil; water capacity, 4,000 gallons. Weight in working order: adhesion, 58 tons 10 cwt.; engine, 79 tons 10 cwt.; engine and tender, 127 tons 16 cwt.

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British Locomotive Practice and Performance.

By CECIL J. ALLEN,
A.M.Inst. T., A.I.Loco.E.

Photo.] MIDLAND RAILWAY. [*A. J. Pople.*
Birmingham–Bristol Express. 4-4-0 locomotive, No. 414.

ALL praise is due to the Great Eastern Railway in that it was the first to "turn the corner" in the improvement of its emergency train services and by the extensive use of oil firing on locomotives to reinstate a number of the cancelled trains and restaurant cars, while there was still no sign of a settlement of the coal dispute. The coal strike of 1912 found the Great Eastern the best prepared of all railways with coal stocks, and this was the only line which managed to maintain a substantially unaltered train service throughout that period. But supplies at the beginning of the 1921 dispute were very much smaller, and although wood and coke were employed on a very considerable scale, it was only by a return to oil-firing on the Holden system, which had figured so prominently during the 'nineties and the early years of the present century, that it became possible to improve main line travel, and at the same time, by relieving the demand for wood, coke and coal, to enable suburban and branch services to be increased to some extent. About 50 of the "Claud Hamilton" class 4-4-0's were thus equipped, as also a number of goods engines, though the remainder of the tender and tank locomotives in service continued to use the varied fuels just mentioned so far as they were still available.

The Great Central fitted up nearly all the London district 4-6-2 tank engines for oil-fuel and was therefore able not only to restore almost complete London suburban services on weekdays, but also to reinstate Sunday facilities. Various main line engines were also fitted. The Midland similarly equipped a considerable number of engines, principally of the 4-4-0 type, with a specially designed apparatus, whilst on several other lines the Scarab or other types of burner were fitted more or less experimentally to a few locomotives only. As a rule, however, the difficulties of the fuel situation were chiefly met by the use of foreign coal and of substitute fuels.

It is necessary, therefore, to utter a word of caution to those who imagine that they see in the somewhat extensive use of oil as a steam-producing agent on locomotives—though this has not been quite so general as one might gather from many press reports—the dawn of an era in which coal will no longer be employed on the railways. Like most questions of this character, this is one of simple economics. At the present time the price of oil is falling rapidly, and it may be that oil will for a while prove a cheaper fuel than

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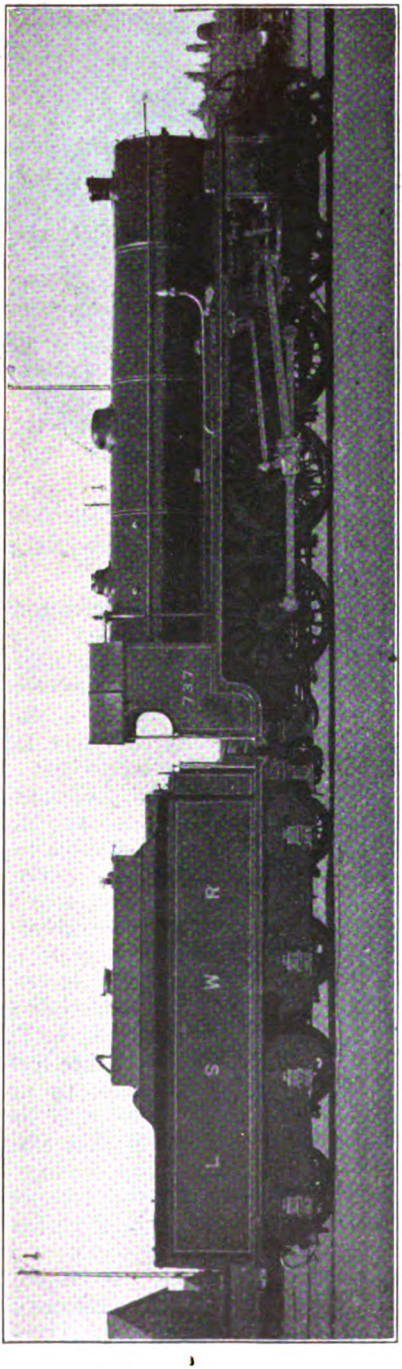

LONDON & SOUTH WESTERN RAILWAY EXPRESS LOCOMOTIVE No. 737, FITTED WITH SCARAB OIL-BURNING APPARATUS.

coal. In that event we may expect to see a still further development of the use of oil firing on locomotives, more especially as suitable oil possesses certain advantages over coal; it reduces practically to nil the physical labour involved in firing, gives a clear and intensely hot fire without a trace of clinker or trouble with sparks, and enables a fireman to produce steam to a nicety, exactly where and in what quantity the driver requires it.

Ultimately, however, economic laws are bound to re-assert themselves. World supplies of oil are limited in a very far greater degree than world-supplies of coal. An excessive drain on the former will gradually force up again the price of oil, while on the other hand the coal dispute may be said to have arisen mainly from the imperative necessity for a fall in the price of that commodity. Directly an appreciable economy is to be effected by reverting to coal-burning, therefore, we are certain to see many locomotives at present oil-fired dismantled of their oil-firing appliances. Indeed, the Great Eastern Railway, remembering the circumstances in the early part of the present century which caused a cessation of the oil firing then extensively in vogue, stated expressly in its announcements relative to the crisis that the 50 locomotives concerned had been altered in such a way as to burn coal or oil at will. These, it seems, are the lines on which alone oil-firing can become a successful proposition. The principle is that of a simple equipment which can be fitted at short notice to fireboxes and tenders, allows at will the use of either oil or ordinary fuel, or a combination of both, as on the Great Eastern Railway, and can be removed with equal facility when no longer required, for storage against a future emergency of the same nature.

Without further preamble, let me turn to the Great Northern locomotive work which I promised last month to describe. I have long been desirous of presenting in tabular form my experiences with colossal loads on this railway, and the reappearance during the recent coal dispute of trains of extraordinary bulk affords an opportunity of summing up my most notable war and post-war runs of this character. It will be seen that the table includes journeys in the early part

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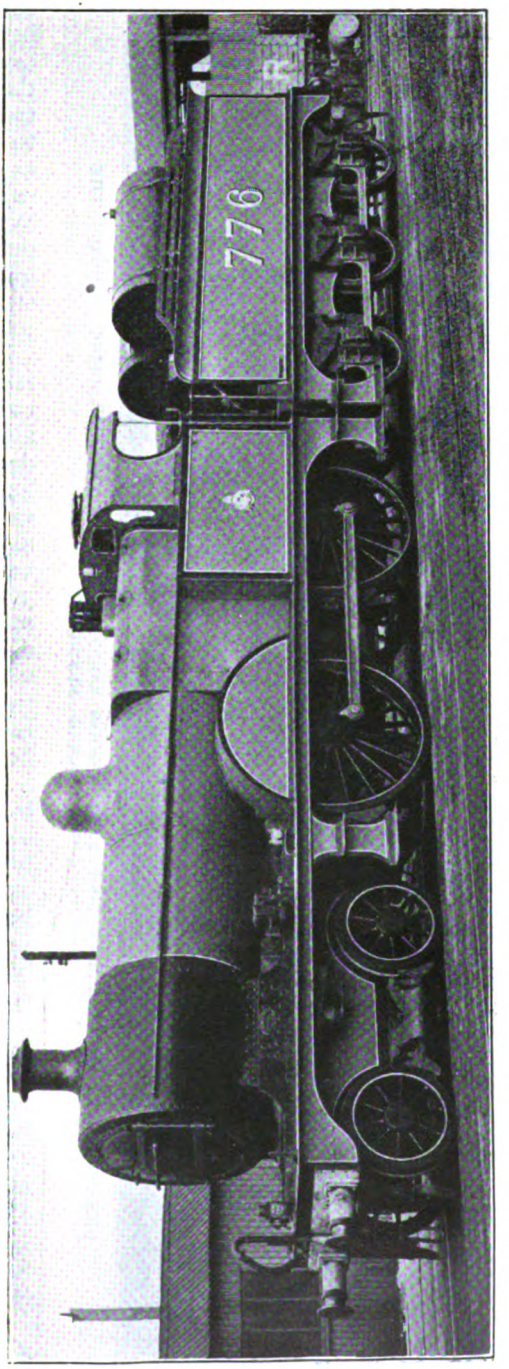
of the war, when a reduced service of heavily-loaded expresses was being worked to pre-war times; journeys at the worst war period, when vast trains were being taken out of London, but the schedules—admittedly easy, of course—were being substantially improved on; and, lastly, journeys during the recent emergency period, when war loads have reappeared, but not war schedules, the locomotive work called for on the accelerated post-war schedules being of the very highest order. The tables are of particular interest in that they introduce, for the first time, the work of Mr. Gresley's new three-cylinder "Moguls," of the "1000" class, which, with the ordinary two-cylinder large-boilered 2-6-0's, have been relied on principally to work the heaviest trains, so that piloting out to Potter's Bar might be avoided. As regards piloting, when "Atlantics" were used on the heavy expresses out of King's Cross, efficient assistance was usually given by one of the new superheated 0-6-2 tanks, and one such run on the down day "Scotsman" figures in the table.

In dealing with the main table, from London to Grantham, it may be well if I outline first the principal gradients, for the sake of those unfamiliar with them. The start out of King's Cross is a difficult one, miles 0·3 to 1·6, through two tunnels where the rails are generally greasy as a result of damp, being inclined at 1 in 105–110. From Holloway to Harringay the tendency is still against the engine, and then, after a mile down, mostly at 1 in 264, through Hornsey, there follows, from 4·5 to 12·7 miles, the unbroken 1 in 200 of Potter's Bar bank, terminating at the station of that name. If pilot assistance is provided out of the terminus, the pilot comes off here. From Potter's Bar to the true summit at 23·9 miles (just after Woolmer Green Box, 23·5 miles, up side of line), there is a "dip" to the Lea Valley at 18·5 miles—5·8 miles down at 1 in 200–330, followed by 5·4 miles up, mostly



MIDLAND RAILWAY 4-4-0 LOCOMOTIVE No. 776, FITTED WITH SIR HENRY FOWLER'S OIL-BURNING APPARATUS.

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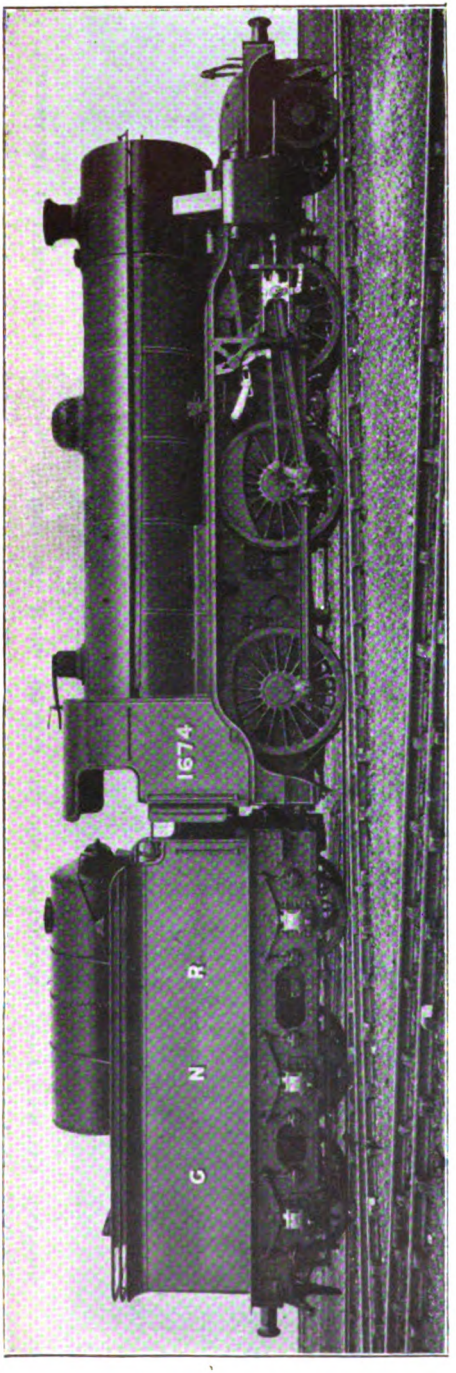

GREAT NORTHERN RAILWAY 2-6-0 FAST GOODS LOCOMOTIVE, No. 1674, BURNING OIL ON THE SCARAB SYSTEM.

at 1 in 200, except the practically level mile over Welwyn Viaduct (21·1–22·0 miles). There is another slight dip between 23·9 miles and Stevenage, at the centre of which (26·5–26·8 miles) are found the recently installed Langley track-troughs. The latter prove most valuable to the drivers of heavy down expresses, as thereby they are relieved of the fear of running short of water before reaching Werrington (79·7 miles); there is no doubt, indeed, that this provision has improved the average work on the early stages of the Great Northern down journey.

From Stevenage for over 30 miles to Huntingdon, there is one of the finest racing stretches of line in the country, although it is by no means exclusively downhill. Steeply inclined at first, 28·7–33·5 miles being at 1 in 200, the grade eases to 1 in 264–400 thence to Arlesey, after which there is a short level and adverse (0·7 mile at 264) stretch from 36·9 to 38·5 miles. From 38·5 to 40·8 miles the fall is resumed at 1 in 264–330, and then there are barely perceptible undulations as far as Huntingdon station (58·9 miles), the most noticeable being the 1·3 miles down at 1 in 264 beyond Sandy (42·5–43·8 miles), and the "hump" on which stands St. Neot's, led up to by a 1 in 330 ascent from 48·2 to 51·9 miles (although that is broken by a sharp fall at 200–264 from 49·8–50·5 miles), and led away from by 1·2 miles at 1 in 200, and 2·2 at 579. From 58·9 to 61·8 miles we have Stukeley bank, all at 1 in 200, the summit of which is nicely marked by Leys Box, on the up side, 62·0 miles. Then, after a level mile, there is an exactly corresponding descent from 62·8 to 67·2 miles (Abbot's Ripton bank), followed by a level run into Peterborough, save for a sharp ascent at 1 in 150–264 from 71·5 to 72·5 miles (Yaxley), and another sharply undulating mile into Peterborough.

The latter station stands on a grade of 1 in 270 against down trains, and those which stop are therefore assisted by a "pusher" in rear out of the platform; the grade continues to 77·1 miles, but from 77·7 to 80·7 the line falls, at first at 1 in 330, and afterwards at easier grades. Werrington Junction (box on down side, 79·5 miles), is an important point to

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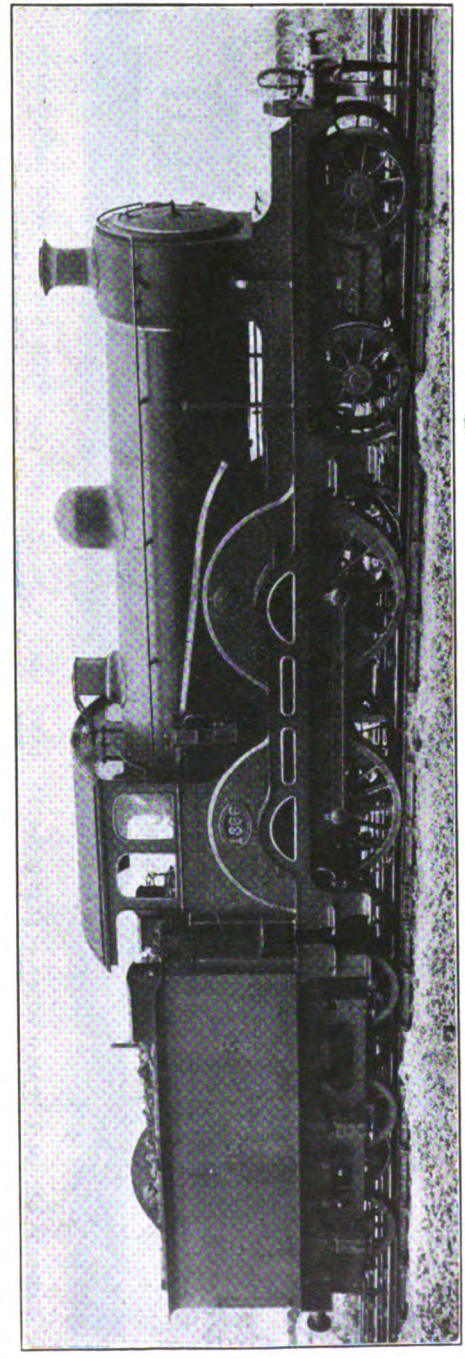
time. From the 80¾ mile post there is an almost continuous rise to Stoke Summit; as far as 85·1 miles it is very gradual; from there to 86·5 miles it is at 1 in 440 and from 87·1 to 88·9 at 1 in 264; from 90·9 to 95·5 it steepens to 1 in 200; while from Corby to Stoke Summit (97–100 miles) we have the steepest part of the climb, at 1 in 178. The short gaps in the distances given are level or at easier uphill grades. Stoke Box itself, which should on no account be missed by recorders, is on the up side, 100·1 miles from London. From the summit to Grantham is a continuous descent at 1 in 200.

From this introduction I pass to the runs themselves. The first was made on the combined 1.30 and 1.40 p.m. from King's Cross, and was a fine example of what the superheated "Atlantics" could do with a 13-coach train on the pre-war timing of 83 min. to Peterborough. Potter's Bar was passed at a shade under 36 m.p.h., and we touched 70½ at Hatfield, while the minimum at Woolmer Green was 52½ m.p.h. A very fast run was made from Hitchin to Huntingdon in 22 min. 20 sec., with a sustained maximum of 82 m.p.h. at Arlesey, a minimum of 62½ at St. Neot's and a further maximum of 70½ at Offord; then we fell to 52 m.p.h. on Stukeley bank before touching 75 on Ripton descent. So the loss to Peterborough with this big train was only ½-min. Equally fine was the work beyond Peterborough; the various times on the ascent to Stoke, where the minimum speed was 40 m.p.h., are the best in the table, with the exception of that from Bytham to Corby, where the new "Mogul" No. 1003 takes the lead. Doncaster was reached in 87 min. 40 sec. from Peterborough on this occasion, or just inside the 88-min. schedule for the 79·6 miles.

The second trip was made on the 5.30 p.m. down shortly after that train had first incorporated the 5.45 p.m. down Leeds, but the additional load was allowed for in the schedule only to the extent of 3 min. extra between London and Grantham. No. 1436 therefore had a train of 14 eight-wheelers to work to Grantham in 120 min., and yet only lost 1½ min. on schedule. It will be seen that the times of run No. 1 were improved on as far out as Hitchin, the minima at Potter's Bar and Woolmer Green being respectively



GREAT EASTERN RAILWAY 4-4-0 LOCOMOTIVE No. 1866, FIRED WITH OIL-FUEL ON THE HOLDEN SYSTEM.

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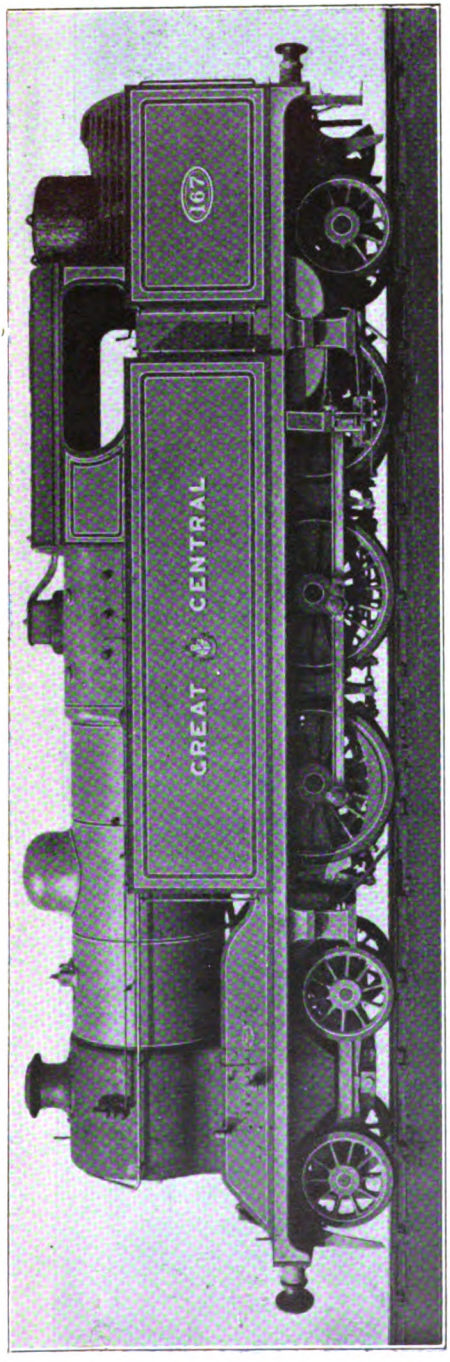

GREAT CENTRAL RAILWAY 4-6-2 SUPERHEATER TANK ENGINE No. 167, FITTED WITH OIL-BURNING APPARATUS, "UNOLCO" SYSTEM.

34½ and 53 m.p.h., with an intervening maximum of 70½ at Hatfield; after that we just touched 80 at Three Counties, but the subsequent times were slower than No. 1 till we fell behind the latter at Holme. At St. Neot's and Leys Box the minima were 58½ and 46 m.p.h., and the maximum was 72½ on Ripton bank. So Peterborough was passed in 83 min. 40 sec., and beyond this point the times of the two first runs were in close correspondence throughout to Grantham; we should really have kept time, had not Bentley rather unaccountably eased his engine after Corby, with the result that speed fell to 32 m.p.h. at Stoke. Beyond Grantham a fine run was made to Doncaster in 53 min. 20 sec (50·5 miles), by the same engine (1436) and driver; Newark, 14·6 miles, was passed in 15 min. 55 sec., Crow Park, 21·9 miles, in 22 min. 20 sec.; Markham Summit (box on up side) 28·2 miles, in 29 min. 35 sec.; Retford, 33·1 miles, in 34 min. 55 sec.; and Piper's Wood Summit (box on down side), 43·9 miles in 45 min. 35 sec. Maxima were 76½ m.p.h. before Newark and 68 before Retford, with a minimum of 44 at Markham, and the small loss of 1½ min. to Grantham was just more than made up on the 55 min. booking thence to Doncaster.

I include Run No. 3 principally on account of the extraordinary time of 21 min. 40 sec. achieved over the 27 miles from Hitchin to Huntingdon, which is easily my record. Driver Warren was hampered at the start by a bad fog, which continued to Hitchin, and made the rails very greasy through the tunnels to Holloway; we just managed to keep on the move, but only just. After clearing the fog area at Hitchin, however, we went like the wind; we passed Hitchin at 71½ m.p.h., Arlesey at 80½, Langford at 70½, Biggleswade at 77½, Tempsford at 75, St. Neot's at 68 (an astounding figure, this!), Offord at 75, and Leys Summit at 53½ m.p.h. Then came the p.w.r. check at Abbot's Ripton, costing 2 min., after which we touched 66 m.p.h. at Holme. The work beyond Peterborough was not quite up to that of the preceding trips: we did not exceed 57½ m.p.h. on the Tallington "level," and fell to 31 m.p.h. at Stoke Summit; and an exceptionally cautious descent from Stoke to Grantham

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was a source of a little more loss of time. Had we made a normal start from King's Cross to Wood Green, however, the net time to Grantham would not have been more than 121 or 122 min.

No. 4 was a remarkable trip on the 5.30 p.m. Newcastle, Leeds and Hull down express, made after the time to Grantham had been eased from 117 to 125 min.; the train was one of 15 large eight-wheelers, and the driver that most competent of men—Ducker of Doncaster. The start was wonderful with such a load; it shares with that of No. 1436 the honours to Finsbury Park of the unpiloted trips, but has no equal out to Hatfield. At Potter's Bar the minimum rate was 39 m.p.h., and at Woolmer Green 48½, the maximum at Hatfield being 68 m.p.h. After Hatfield we did not exceed 75 m.p.h., and although the running thence was good (minima at St. Neot's and Leys 60 and 46½ m.p.h., and maximum at Holme 71½), the engine was not really pressed again until Tallington had been passed. From this point the best time of the series was made to Essendine, and fine times would probably have followed, but for the bad check at Bytham. At Grantham, No. 272, superheated, came on, and succeeded in passing Newark in 16 min. 35 sec., at 74 m.p.h.; Crow Park in 22 min. 55 sec; Markham Box in 29 min. 55 sec. at 45½ m.p.h.; Retford in 35¼ min.; Piper's Wood Box in 46 min. 25 sec; and Doncaster was reached in 54 min. 40 sec., allowed 56 min. It may be mentioned, as a striking fact, that the best times taken from the first four runs between London and Grantham, with loads averaging 57 axles, or 440 tons, work out at 27¾ min. to Hatfield, 41¼ to Hitchin, 63 to Huntingdon, 79¾ to Peterborough, 109¾ to Stoke, and 116¼ to Grantham—¾-min. inside the pre-war timing of the 5.30 p.m. down, which carried an average load never exceeding 290 tons. Of this aggregate time, No. 1453 supplies the times to Hatfield, No. 1401 thence to Hitchin, No. 1442 on to Leys Box, No. 1401 from Bytham to Stoke, and the four engines equally on other sections.

We now come to runs made since the war, including the great majority of those occupying the remainder of the table. In comparing the running with that displayed on the first four trips, readers should not forget the substantial drop in the quality of the fuel burned, which obviously cannot be without its effect on the performance of the engines. No. 5 journey was a plucky effort on the part of small "Atlantic" No. 987, superheated, on the 1.20 p.m. down, on the day preceding the opening of the Royal Show at Darlington last summer. Well do I remember this journey! The train was simply flooded with passengers a good hour before starting; the serving of lunch proceeded merrily until about 5 p.m., after which teas were consumed by patrons spread all over the first-class dining car, picnic fashion, both chairs and the floor being fully occupied. No. 987 made a splendid start to Finsbury Park, but the long climb to Potter's Bar resulted in some loss of "wind," and we fell to 29 m.p.h. Top speed at Hatfield was 66 m.p.h., and beyond Hitchin 76½, while the minimum at Leys was 39½ m.p.h. We took Peterborough at a somewhat higher speed than usual, as is evident from the fast time onwards to Werrington, but the long rise to Stoke gradually left our overloaded steed more and more breathless, until finally we fell to 24 m.p.h. at the summit. Still, I consider the net loss of 2½ min. on schedule to Grantham remarkably small in the circumstances.

Next we come to the exploits of the new three-cylinder "Mogul," No. 1003, which probably will prove of more interest to readers than all the other runs in the table. I am not going to deny that I was really rather disappointed with this run; perhaps the more so as I had noticed Mr. Gresley himself in conversation with the driver before we started, and knew that the designer was travelling on the train—the 5.40 p.m. *ex* King's Cross. At the same time, the running at two different points was significant of the real capabilities of the new engines, and the inference is a strong one that the engine was being worked expressly under easy steam—probably because it was comparatively new. In support, I have a really remarkable run behind No. 1001 on the up journey, when a 63-axle train was worked from Peterborough to London in a net time of 88 min., which included an astonishing start of 20½ min. out to Huntingdon; but of this feat, more in

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GREAT NORTHERN RAILWAY—WORKING OF HEAVY

Distances.								
		No. of Run	1	2	3	4	5
		Train, *ex*-King's Cross	1.30 p.m.	5.30 p.m.	10 a.m.	5.30 p.m.	1.20 p.m.
		Engine, superheated 4-4-2 No.	1401	1436	1442	1453	987*
		Pilot to Potter's Bar, 4-4-0 No.	—	—	—	—	—
		Load (axles)	54	56	58	60	60
		Load (tons tare)	376	404	416	422	411
		Load (tons full)	415	435	450	460	455
miles.	miles.		m.s.	m.s.	m.s.	m.s.	m.s.
0.0	0.0	King's Cross dep.	0.00	0.00	0.00	0.00	0.00
2.5	2.5	Finsbury Park pass	8.25	7.35	15.20(*a*)	7.35	8.25
5.0	5.0	Wood Green ,,	12.00	11.05	20.00	11.05	12.20
9.2	9.2	New Barnet ,,	18.35	17.05	26.15	17.05	19.10
12.7	12.7	Potter's Bar arr.	pass	pass	pass	pass	pass
—	0.0	dep.	24.35	22.55	32.10	22.15	26.20
17.7	5.0	Hatfield pass	30.15	28.35	37.55	27.45	32.25
25.0	12.3	Knebworth ,,	37.35	35.55	45.45	35.35	40.55
31.9	19.2	Hitchin ,,	43.55	42.15	52.15	42.15	47.40
37.0	24.3	Arlesey ,,	47.45	46.15	56.15	46.25	51.50
44.1	31.4	Sandy ,,	53.20	52.00	61.45	52.35	59.20(*d*)
51.7	39.0	St. Neot's ,,	59.55	58.55	68.00	59.50	67.45
58.9	46.2	Huntingdon ,,	66.15	65.40	73.55	66.40	75.25
62.0	49.3	Leys Box ,,	69.35	69.20	77.05	70.15	79.30
69.4	56.7	Holme ,,	76.10	76.25	85.15(*b*)	77.25	87.25
76.4	63.7	Peterborough arr.	83.30	pass	pass	pass	pass(*e*)
—	0.0	dep	0.00	83.40	92.15	85.20	95.30
79.5	3.1	Werrington Junction pass	6.25	88.55	97.35	91.00	100.10
84.8	8.4	Tallington ,,	12.10	94.45	103.35	96.55	106.35
88.6	12.2	Essendine ,,	16.20	98.50	107.45	100.55	111.35
92.2	15.8	Little Bytham ,,	20.35	103.00	112.05	105.45(*c*)	116.50
97.1	20.7	Corby ,,	27.20	110.00	119.45	115.10	126.10
100.1	23.7	Stoke Summit Box ,,	31.30	114.55	124.55	119.55	132.35
105.5	29.1	Grantham arr.	pass 37.00	121.30	132.00	126.25	140.05
			min.	min.	min.	min.	min.
76.4		Net time, London-Peterborough	83½	83¾	90¼(*a*)	85¼	93
29.1		Net time, Peterborough-Grantham	37	37¼	39¾	38½	44½
105.5		Net time, total	120½	121½	130	123¾	137½
105.5		Schedule, London-Grantham	118	120	120	125	135

* Small-boilered type.

Delays:
(*a*) Thick fog and greasy rail to Finsbury Park; not allowed for in net time.
(*b*) p.w.s., Ripton, severe.
(*c*) Signals, Little Bytham.
(*d*) p.w.s., Langford, slight.
(*e*) Signals, Fletton Junction, severe.

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EXPRESS TRAINS, KING'S CROSS—GRANTHAM.

6	7	8	9	10	11	12	13	14	15
5.40 p.m.	1.40 p.m.	5.30 p.m.	1.20 p.m.	2 p.m.	1.40 p.m.	10 a.m.	1.30 p.m.	1.30 p.m.	1.30 p.m.
1003†	1645‡	1431	1444	298	1417	1459	1402‖	1416¶	1407
—	—	1346	1312	1314	1314	1745§	1080	1346	1314
60	62	66	66	68	66	66	70	70	74
424	443	448	459	461	478	460	448	483	506
490	490	495	500	505	520	515	520	545	575
m.s.	m.s.	m.s.	m.s.	m.s.	m.s.	m.s.	m.s.	m.s.	m.s.
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7.45	8.15	6.40	6.30	6.20	7.40	6.30	7.30	6.45	8.05
11.30	12.10	10.05	9.45	9.30	11.15	9.35	10.50	10.30	11.20
18.35	19.05	16.00	15.30	15.00	17.20	15.05	16.10	16.10	17.00
pass	pass	21.35	21.05	20.30	23.05	20.20	21.40	22.00	22.40
25.20	25.35	23.25	22.50	22.40	24.45	21.20	22.50	23.10	24.30
31.25	31.50	31.30	30.55	30.45	32.40	29.45	30.50	31.45	32.55
39.50	41.15	40.25	39.40	39.00	41.05	37.25	39.40	40.20	41.45
48.25(*f*)	49.35	47.30	47.05	45.55	48.30	44.35	46.55	47.35	49.00
53.35	54.50(*k*)	51.50	51.35	50.10	53.00	48.45	51.05	52.15	53.15
61.35	62.50	58.20	58.35	56.45	59.50	54.45	57.10	60.00	59.35
71.55(*g*)	71.30	65.50	67.25	65.00	68.30	64.25(*o*)	64.35(*p*)	69.55	67.15
79.25	79.05	72.50	75.20	72.15	77.05	72.10	73.00(*q*)	78.05	75.10
82.50	84.05	76.35	79.35	76.20	82.35	76.10	80.40	82.50	80.20
89.50	93.15	83.50	87.30	84.25	91.50(*n*)	83.40	89.35	91.10	89.10
97.25	pass	pass(*m*)	pass	pass	pass	92.10	98.00	99.50	98.30
0.00	103.20	99.10	96.25	92.55	104.15	—	0.00	0.00	—
6.45	109.10	(*m*)	102.20	98.30	110.35	—	7.25	7.15	—
13.00	116.10	(*m*)	108.50	105.05	116.35	—	14.00	13.45	—
17.10.	121.25	(*m*)	113.25	109.55	120.50	—	18.35	18.30	—
21.10	126.40	(*m*)	118.20	114.55	125.00	—	23.25	23.25	—
27.40	132.10	(*m*)	127.15	123.40	132.35	—	32.35	31.55	—
33.15(*h*)	140.55	(*m*)	132.45	129.50	138.10	—	38.50	37.25	—
							pass	pass	
41.10	148.35	154.25	139.40	136.50	146.10	—	45.15	43.35	—
min.	min.	min.	min.	min.	min.	min.	min.	min.	min.
94	101¾	92**	96½**	93**	100**	90**	92½**	99¾**	98½**
38¾	45¼	41	43¼	43¾	42	—	45¼	43½	—
132¾	147	133**	139¼**	136¼**	142**	—	137¾**	143¼**	—
132	148	133	135	138	148	94††	147	147	103††

† Three-cylinder 2-6-0.
‡ Two-cylinder 2-6-0.
§ 0-6-2 tank.
‖ 284 *ex*-Peterborough.
¶ 1406 *ex*-Peterborough.
** Includes time standing at Potter's Bar.
†† London-Peterborough only.

Delays:
(*f*) p.w.s., Langley, slight.
(*g*) p.w.s., Tempsford, severe.
(*h*) p.w.s., beyond Corby, severe.
(*k*) Signals, Arlesey, moderate.
(*m*) Severe signal checks and stops, Fletton Junction to Corby.
(*n*) p.w.s., Wood Walton, severe.
(*o*) p.w.s., Tempsford, severe.
(*p*) Signals, Tempsford, slight.
(*q*) Signals, Huntingdon, walking pace.

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Photo.] GREAT NORTHERN RAILWAY. [*F. E. Mackay.*

Newcastle–London Express. Superheated 4-4-2 Locomotive, No. 1450.

the next issue. Reverting to the exploits of No. 1003, I have to remark, in the phrase made familiar by war *communiqués*, that as far as Huntingdon there was "nothing to report." Our start to Finsbury Park, though good, did not quite equal that of No. 1453, with the same load; at Potter's Bar we fell to 31 m.p.h. and at Hatfield rose to 65; and down the bank from Hitchin we simply ambled at a modest 62½ an hour.

But at Huntingdon the engine was obviously "opened out"; the drop in speed up Stukeley bank was merely from about 58 to 49 m.p.h., and speed then rose to a sustained 71½ m.p.h. on the descent to Holme. Indeed, it rose momentarily to 72½—an astonishing figure for six-coupled wheels of only 5ft. 8 in. diam. So the 17·5 miles from Huntingdon to the stop at Peterborough were compassed in exactly 18 min. Out of Peterborough, again, we started very gently, but for the second time the engine was opened out beyond Tallington, and speed rose on the gradual subsequent ascent from 50 to 57 m.p.h. near Essendine, while the subsequent harder grades to Bytham did not bring it below 51, nor the 5¾ miles at 1 in 200 past that station to anything less than 43½ m.p.h. This was first-class work with a 460-ton train, and, as I have already said, provides us with some measure of the real capacity of these fine engines. Net time from London to Peterborough was therefore as booked, and thence to Grantham only ¾-min. over the difficult allowance of 38 min.—the hardest of the day. Had the start from Peterborough been anything like the running beyond Essendine—the time from Bytham to Corby is easily the best in the table—it is obvious that time would have been kept without difficulty.

No. 1645's journey on the 1.40 p.m. from King's Cross, early in 1919, was a considerably more tame affair, but there was, of course, a considerably greater allowance of time. As far as Huntingdon there is a strong "family likeness" between the work of the two 2-6-0 engines; No. 1645 passed Potter's Bar at 32 m.p.h., Hatfield at 59, Woolmer Green at 40, and did not exceed 60 on the descent from Stevenage. But after Huntingdon No. 1645's work fell off badly; minimum speed at Leys Box was 32 m.p.h., and the time to and through Peterborough was adversly affected by the extraordinary

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caution with which the driver approached the station—doubtless the result of his being accustomed to the working of loose-coupled goods trains—which compelled him to put on steam again before we had even reached the platform. Then we went fairly well up to Stoke, with a minimum of 29½ m.p.h., and would have arrived quite punctually at Grantham but for another terribly cautious finish. As previously mentioned, however, these engines have been very largely used on the principal expresses during the recent coal dispute; the 9.50 a.m. down Leeds and Edinburgh and the 1.40 p.m. down Leeds and York have been so hauled practically every day, with one of the 1000's on the 5.40 p.m. down.

Now we come to the piloted journeys. The general minimum load for one of the "Atlantics" before a pilot could be claimed has, I believe, been one of 66 axles, and the piloted runs in the table begin thus, although I have known pilots taken for smaller loads than this. No. 1431's run was on the 5.30 p.m. down, on the timing of 133 min. to Grantham instituted after the Leeds train had become again a separate working, and was of good quality throughout to Holme, without being exceptional on any stage; beyond Holme the running was ruined by signal delays. We touched 61 m.p.h. at Hatfield, fell to 42 at Woolmer Green, and sustained 75 beyond Hitchin. The short rise beyond Arlesey brought speed down to 66 m.p.h., but we rose to 69 at Biggleswade; minimum at St. Neots was 56½ m.p.h. and the maximum at Offord 65. To run from Hitchin to Huntingdon in 25 min. 20 sec. with a train of all but 500 tons was quite an exploit. Lowest speed on Stukeley bank was 45 m.p.h., and we touched 71½ in descending to Holme; Yaxley, 59.9 miles from Potter's Bar, was passed in 63 min. 35 sec. from the start.

No. 1444's run, in column 9, was the only failure to keep time that I recorded with one of these very heavy trains. It was made on the 1.20 p.m. down, with 135 min. allowed to Grantham. The start to Potter's Bar, assisted by 4-4-0 No. 1312, was better than that made by 1431 and 1346, and No. 1444 made an even better start from Potter's Bar to Knebworth (maximum speed at Hatfield 62½ m.p.h.) than No. 1431, but beyond there the work steadily fell off, and with a maximum of only 69 m.p.h. at Three Counties, and a minimum of 41

Photo.] GREAT NORTHERN RAILWAY. [*F. E. Mackay.*

1.40 p.m. Down Leeds, Bradford and Newcastle Express. 2-6-0 three-cylinder locomotive, No. 1000.

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at Leys Summit, not to mention the lowest rate of 31½ m.p.h. at Stoke, we succeeded in dropping 4¾ min. on schedule. On this occasion, strangely enough, No. 1431 came on at Grantham, and did fine work with the 500-ton train on to Selby; Newark was passed in 17½ min., Markham in 33 min. 5 sec., Retford in 38 min. 35 sec., and Piper's Wood in 49 min. 55 sec.; Doncaster would have been passed in 58 min., but for signal delays, and Selby was reached in a net time of 80 min. although allowed 83.

Nos. 298 and 1314, on the 2 p.m. down the same pilot, on the post-war 1.40 p.m. down Newcastle, made the feeblest of all the ascents to Potter's Bar, and achieved nothing worthy of mention (although time was well in hand all the way) until after suffering the delay at Holme; the subsequent work was distinctly good, the time of 41 min. 55 sec. between Peterborough and Grantham being substantially better than that achieved by any other "Atlantic" on these very heavily loaded trains. A speed of 56½ m.p.h. was attained at Tallington, and the minimum rate at Stoke Summit was 26 m.p.h.

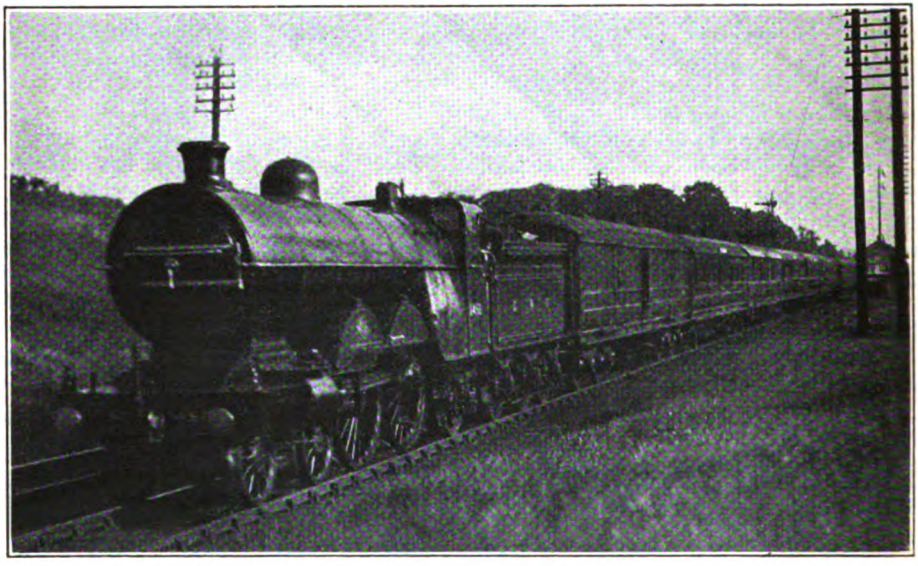

Photo.] GREAT NORTHERN RAILWAY. [*F. E. Mackay.*

5.40 p.m. Down Leeds, Bradford, Hull and Newcastle Express. Superheated 4-4-2 express locomotive, No. 1459.

Scotsman in the earlier days of the war, (allowed 138 min. to Grantham) achieved distinction by passing Finsbury Park in the record time of 6 min. 20 sec., but one of the new 0-6-2 tanks helped a competitor in column 12 to make a slightly better time to Potter's Bar than the 20½ min. achieved on this occasion. After re-starting and touching 61½ m.p.h. at Hatfield, we ran up to Woolmer Green at a minimum of 46½; 74 m.p.h. was the sustained speed at Three Counties, and 68 at Biggleswade, after which the engine was very much eased, and the run had no further feature of note. No. 1417, with

Now comes the joint effort of "Atlantic" No. 1459 and superheated 0-6-2 tank No. 1745 on the 9.50 a.m. *ex*-King's Cross, on the Friday before Whit Sunday, with literally hundreds of passengers occupying the corridors, in addition to those who obtained seats. Truth to tell, the start on this occasion again disappointed me a little, as I expected to see a record time made to Finsbury Park, but beyond Finsbury Park the times on this run easily take the lead to Potter's Bar, and No. 1459 was the only piloted engine to get through Hatfield in less than half-an-hour. This consummation was assisted, however,

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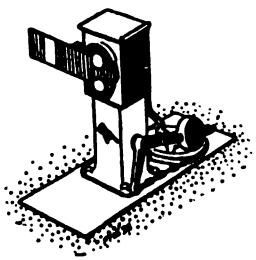
by the record shortness of the time occupied in "dropping the pilot," which amounted to 60 sec. only. The two engines reached 53½ m.p.h. beyond Hornsey, and went up the 1 in 200 past New Barnet and Hadley Wood at a very steady 43 an hour. After re-starting, No. 1459 had no difficulties; we touched 75 m.p.h. at Three Counties, fell to 67 at Langford and rose again to 72½ at Biggleswade; Sandy was passed at 68 and Tempsford at 71½, when there supervened a bad p.w.r. check. The effect of this was felt until beyond Huntingdon, and our lowest rate at Leys Box was 41 m.p.h., after which we touched 71½ m.p.h. on Ripton bank, and ran into Peterborough nearly 2 min. early. We had run the 63·7 miles from Potter's Bar with 515 tons in 70 min. 50 sec., or 68¾ min. net, while our time from London was about 90 min., in both cases inclusive of the time standing at Potter's Bar.

Lastly, there come three runs on the post-war 1.30 p.m. down—a train of vast dimensions. All the drivers concerned had time so well in hand that there is little left to be said about the runs; the actual arrivals at Peterborough were all from 4 to 5 min. early. No. 1402 had delays in addition, and in this case the net time was 92½ min. only from London. On run No. 13 we touched 76½ m.p.h. beyond Hitchin, and were still doing 68 when we passed Sandy; then came the signal delays, that at Huntingdon being to a walking pace. No. 1416 took things easily practically the whole way from Potter's Bar. No. 1407, with a really prodigious train of 18 bogie vehicles—one a Gresley "twin"—did excellently; we touched 61 m.p.h. at Hatfield and fell to 41 at Woolmer Green; then we reached 75 at Three Counties, and were still doing 64 at Sandy and 62½ at Tempsford; at St. Neot's we fell to 52½ m.p.h., and then the engine was eased, as we were getting so much before time. Nevertheless, we covered the 63·7 miles from Potter's Bar to Peterborough, with 575 tons, start-to-stop, in 74 min. exactly.

The continuations of runs 13 and 14 from Peterborough were equally good. No. 1406 made the better start, but No. 284 drew level at Little Bytham; then No. 1406 drew away again until 100 sec. ahead at Grantham. After that No. 284 caught up again, passing No. 1406 between Newark and Carlton, and finishing at Doncaster 40 sec. in front. The times made by Nos. 284 and 1406 beyond Grantham were respectively 58 min. 45 and 5 sec. to Newark; 76 min. 15 and 40 sec. to Markham; 82 min. 35 and 50 sec. to Retford; 94 min. 40 sec. and 95 min. 25 sec. to Piper's Wood; 103 min. 30 sec. and 104 min. 10 sec. to Doncaster stop, 108 min. being allowed. It should be added that the heavy additions made on the majority of these runs to the tare loads, in respect of passengers and luggage, were calculated with the greatest care; in many cases non-corridor stock was in use, and even the corridor stock, when employed, was often well-nigh as full in the corridors as in the compartments. On a number of occasions, too, I was able to ascertain from the train staff the actual number of passengers travelling. As regards the locomotive work, the secret of success of these remarkable "Atlantics" appears to be their unlimited capacity for raising steam, which alone can render such achievements possible; and I have some even more remarkable up journeys to detail in the next issue.



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Signalling School at Wimbledon, London & South Western Railway.

SIGNALLING Schools are now a feature of the training systems of all railways, but that installed by the London and South Western Railway at Wimbledon differs in certain respects from most of the others, and includes several interesting features. In connection with the school, lectures are given periodically on such subjects as "Alternating Current Track Circuit," Automatic Train Control," etc. The School has, therefore, its lecture and theoretical or study side as well as its practical and training aspects.

The distinctive feature of the School, as compared with all others, is that all the illustrations or demonstrations are given by specimens of the actual apparatus in use on the line. A further distinctive feature is that all the details of the apparatus are open or available to sight and touch, so that the technical parts can be seen and watched during their operation. This has been made a specially marked feature to give those in the technical branch full opportunity of examining, handling, and studying the apparatus and its working. A telephone circuit has been fitted up in the upper room with two instruments connected to it, for testing and examination by the younger staff.

In the upper room of the school a cabin (Fig. 1) is fitted up with apparatus as used on the London and South Western Railway. The Sykes' system is represented by three sections of Sykes' "lock-and-block" instruments and bells, together with point and plunger locking, key releases, track circuit control, treadle releases, with actual mechanical and electrically operated signals fitted with the Company's electric replacers, all fitted to the standard pattern mechanical levers and mechanical interlocking.

At the back of the box (Fig. 2) is arranged a miniature railway, divided into track circuited sections, with treadle contacts applied. The Company's standard pattern direct current and alternating current track circuit relays seen on the shelf above control the mechanical and Sykes' "lock-and-block" operations in the signal frame.

Entirely separate from the above is a set of Preece's three-wire electric block instruments as used on about 600 miles of the railway. There is also a set of No. 6 tablet instruments to demonstrate the latest system of single-line working.

Fig. 3 shows the arrangement of the apparatus on the ground floor. There is

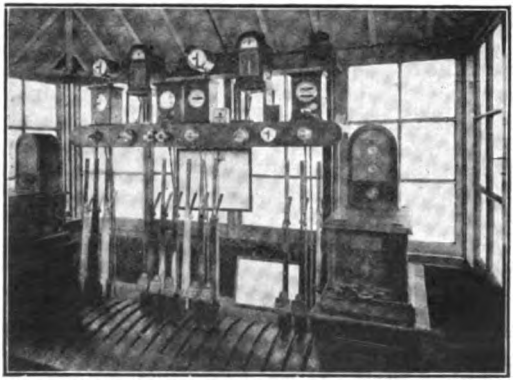

Fig. 1.

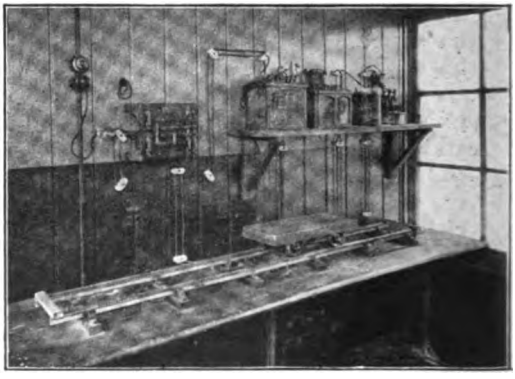

Fig. 2.

VIEWS IN THE WIMBLEDON SIGNALLING SCHOOL, LONDON & SOUTH WESTERN RAILWAY.

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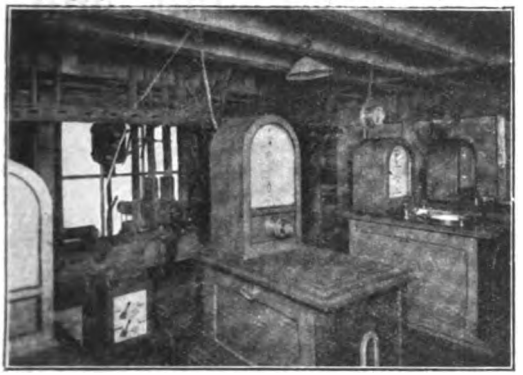

Fig. 3.

TABLET INSTRUMENTS.

the usual mechanical interlocking and undergear, also an electric signal replacer. In addition there is a set of No. 1 and a set of No. 3 tablet instruments, completing the examples of all systems in general use on this railway.

The whole of the apparatus is well illustrated and described by circuit diagrams, instructions, etc., provided in the school for the use of those who wish to study the various apparatus or practice the operation or working of the various systems.

When new or novel apparatus is to be introduced for service on the line, it is tried in the school and demonstrations given to the staff who will be responsible for its working or to others interested.

In Fig. 3 in the bottom of the left-hand corner can be seen two intermediate gate bell indicators under test before being sent to Cadhay and Gosford gates. Staff engaged in technical work have appreciated the opportunities for experiment and trial thus given, as have many members of the operating branches of the service. The desire to master the details of the operations by some of the Traffic Staff has been shown by their staying in the signal box until as late as 9 p.m. (summer time). On two or three occasions the Superintendent of the Line's staff have tried problems in the school to see if the solutions proposed were practicable.

One great advantage of a school of this kind is that the operation can be seen as a whole, which cannot be done in a working signal box, as the signalman only sees the working at the two ends of the sections. Then, in a signal box the safety of the traffic is predominant and practice is a long, and often an impossible process, while in the school this does not apply. Further, the principles upon which the systems depend can be more easily seen and understood in a school arranged for the purpose.

The working of railways in the future will undoubtedly call for men of varied and wide knowledge and experience, and many of the companies have provided signalling and operating schools where the principles of movements of traffic can be studied. Generally a keen interest has been exhibited, especially by the younger members of the staffs of the railways, who appear to rise to the occasion.

The Chief Engineer has taken a very great interest in the institution and progress of the school, and Mr. Thorrowgood, who has been ably assisted by his Technical and Supervisory Staff at Wimbledon, has devoted considerable time to the arrangement and details of the scheme.

It is intended to arrange series of lectures and demonstrations on various subjects connected with railway work next session, and two members of the Superintendent of the Line's office have undertaken to assist students of the operating branches in the rules and regulations of traffic working.

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New Restaurant Cars for Midland and Glasgow and South Western Joint Services.

CONSTRUCTED at the Derby Carriage and Wagon Works of the Midland Railway, to the designs of Mr. R. W. Reid, C.B.E., Carriage and Wagon Superintendent, three new first-class dining and kitchen cars and three third-class dining cars have been added to the stock provided for the joint services between London and Glasgow. These are the first vehicles of their class to be built since Mr. Reid assumed charge of the Carriage and Wagon Works of the Midland Railway, and include many important improvements in design and construction, as will be seen from the following particulars and the illustrations reproduced, for which we are indebted to Mr. J. H. Follows, C.B.E., General Superintendent.

The first-class cars are 65 ft. long over body and are mounted on six-wheeled bogies. Each car consists of two dining saloons with a total accommodation for 22 passengers, a lavatory and luggage locker, a spacious kitchen, two pantries and separate toilet arrangements for the staff. The kitchens in these cars are larger than are usually found on railways in this country, and special attention has been given to making them as convenient as possible for serving the maximum number of meals in what is, after all, a very limited space. There is a large stove with double ovens, gas rings for boiling pots, over these the grills and over these again the hot-water boilers. The kitchen is also provided with a special rapid-heating boiler for providing hot-water required for teas. There is also a hot-plate oven, where some hundreds of plates can be heated at once, and on the top of this oven the joints may be kept hot whilst they are being cut up. Two large wash-up sinks are provided, a refrigerator, nests of drawers for condiments, and ample space for carrying the usual equipment.

The walls of the kitchen are lined with aluminium and the floor is covered with sheet lead, on the top of which are fixed hard wood grids. The butlers' pantries are fitted up with small wash-up sinks and provided with hot and cold water, refrigerators, wine cupboards and silver drawers, and full advantage is taken of every corner of space for the carrying of the necessary culinary equipment. The ventilation of the kitchen, together with the rest of the car, has received special attention; 150 gallons of water are carried in tanks on the roof. Gas for cooking is stored in specially strong cylinders of small diameter, built into the underframe to afford the maximum protection; as an additional precaution each cylinder is provided with a safety valve which cuts off the supply of gas if a fracture of any of the pipe connections should occur. The whole of the woodwork at the kitchen end of the car is of polished birch, and this, with the aluminium, gives a clean, light appearance. An additional convenience which will be appreciated by the staff is the provision of tip-up seats in the corridors and pantries and in the kitchens, these seats being so fitted that they fall flush with the sides when out of use.

Cabinet work in the first-class saloon is of walnut throughout and the upholstery is blue cloth, which is the standard in Midland first-class cars. A Begian Wilton carpet and rugs, which tone nicely with the seat covers and woodwork, cover the floor. A distinctive feature of the cars is the employment of the oval in decoration, both in the large panels in the doors between the compartments and in the roof decoration, also in the frames for the pictures, mirrors and so forth. Mouldings and decorations have been kept as simple as possible to give facilities in cleaning. The lavatory compartments have special marbled cement floors, and are provided with hot and cold water in the wash basins.

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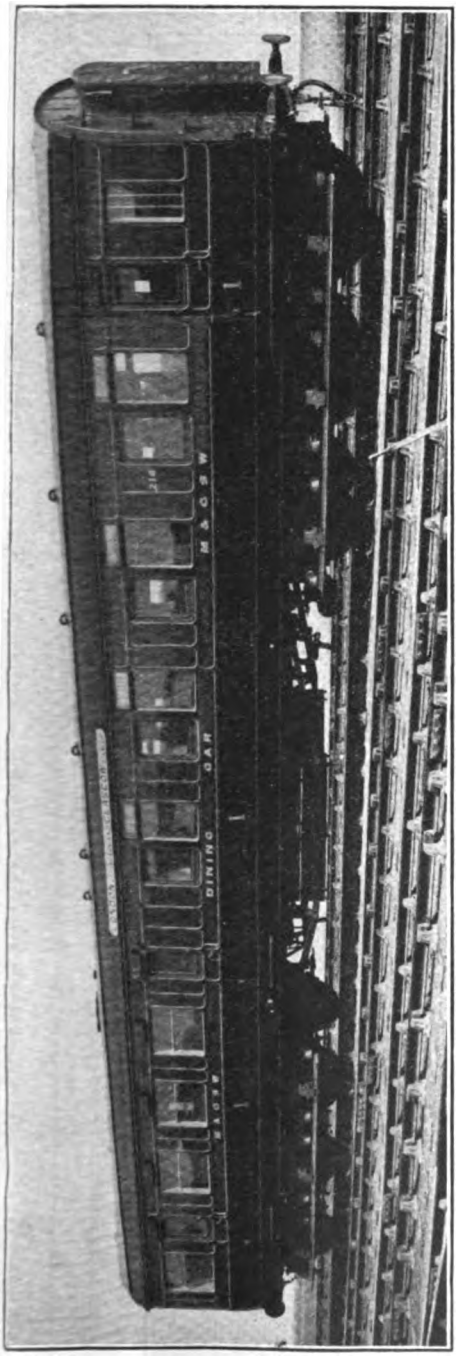
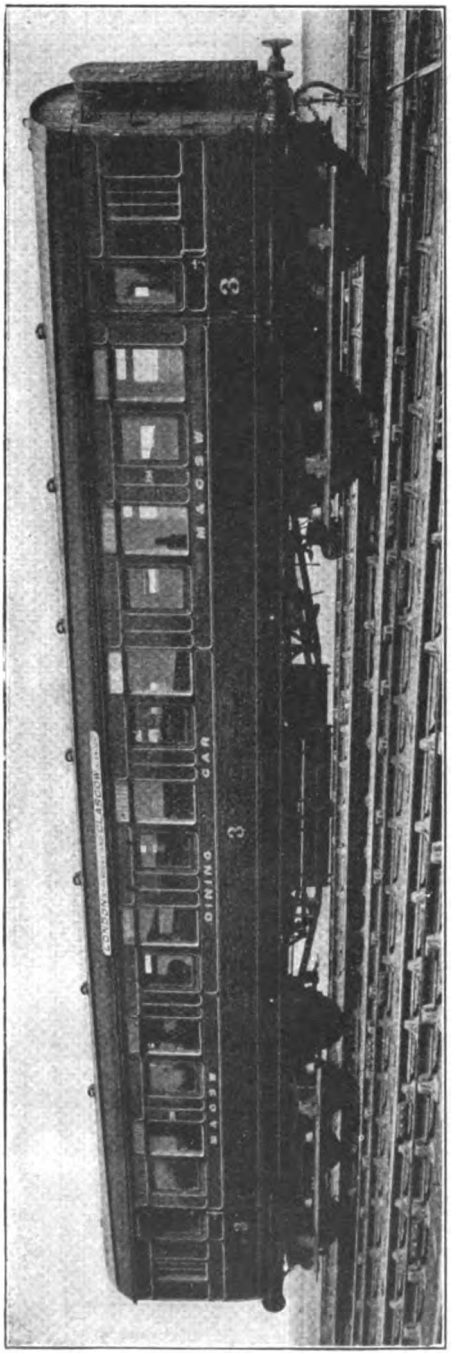


FIRST CLASS DINING AND KITCHEN CARRIAGE.



THIRD CLASS DINING CARRIAGE.

NEW DINING CARRIAGES FOR THE MIDLAND AND GLASGOW & SOUTH WESTERN RAILWAYS DAY ANGLO-SCOTTISH SERVICES.

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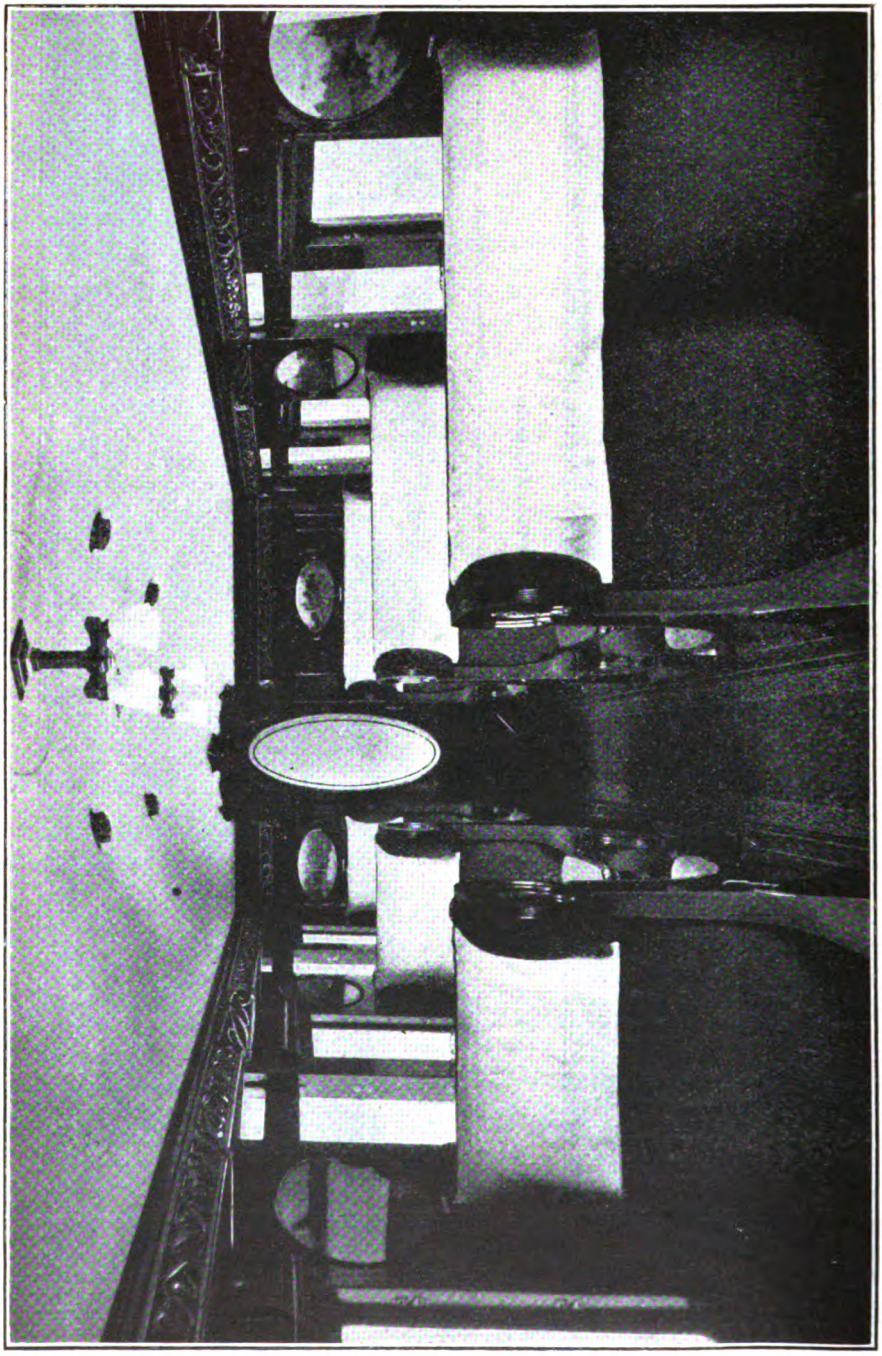

INTERIOR OF FIRST-CLASS DINING SALOON.

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The cars are electrically lighted entirely from the roof, and the style of fitting which is employed is novel in this country. It consists of a square stand with four square arms carrying opal glass shades on which the square design is carried out. The lamps themselves are 25 volt, 12 c.p., gas filled, and the lighting throughout the compartments is even and free from glare.

Heating is by low-pressure steam, the heaters being housed on the side walls and protected by an ornamental grating. This arrangement permits of the maximum floor space being available under the seats for passengers' hand luggage, and this point was also considered in designing the seat ends. The usual racks are provided for light articles, and these, in common with all the fittings in the cars, are finished in Venetian bronze.

The third-class cars are 59 ft. long over body, and are mounted on four-wheeled bogies. These cars are intended to run in conjunction with the first-class, the kitchen on the former supplying both cars. As a consequence the seating capacity of the third-class cars is considerably greater; 42 seats are provided, and in addition there is a lavatory and luggage lockers at each end of the car. Woodwork in the third-class cars is of fumed oak, and the seats are trimmed with Baghdad moquette—the usual Midland pattern. In this car the diamond forms the basis of the scheme of decoraton, and this is reproduced in the sliding doors, picture frames, and on the roof. The oak which has been used for the interior decoration of these cars is very finely marked, and the diamond panelling shows the markings to the best advantage and enhances the effect. The floors of these cars are covered with linoleum, and with a centre strip of horsehair carpet. Arrangements in regard to the lighting, heating and the lavatory compartment fittings are the same as have been described for the first-class cars, and the contrast between the oval panelling in the first-class and the diamonds in the third-class is very pleasing.

All the cars are fitted throughout with the vacuum brake, and by an ingenious method of variable leverage the heavy cars are braked to their full capacity without necessitating the introduction of a larger size of brake-cylinder. The springing of these cars has received very careful consideration to make the riding as smooth as possible, and special precautions have also been taken to deaden sound by the insertion of insulating material between the floors and sides. These new cars form a handsome addition to the stock of vehicles built at Derby.

The Second Instalment of Mr. Ahrons' article on Locomotive and Train Working on the Highland Railway will appear in the September RAILWAY MAGAZINE.

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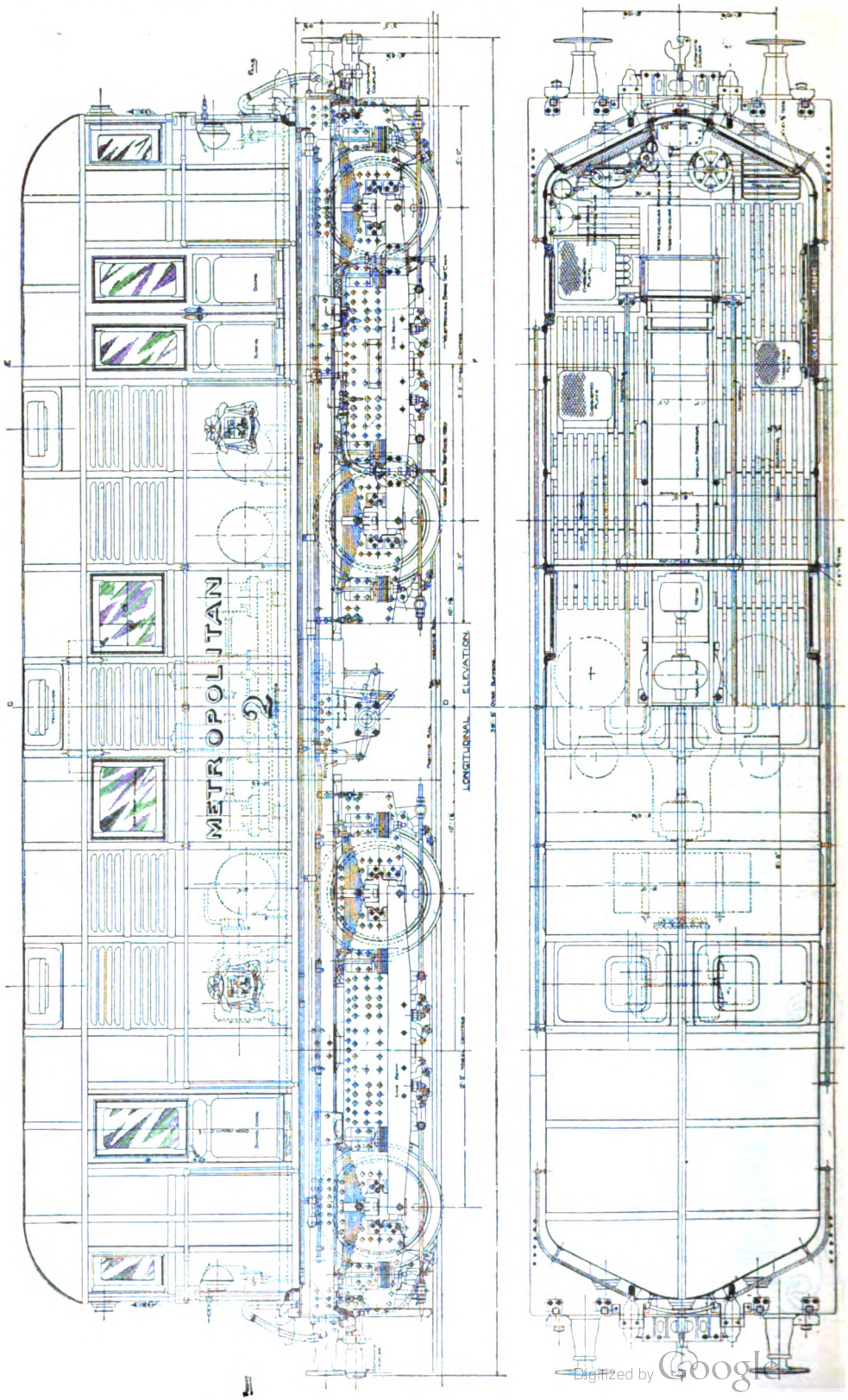

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Reconstructed Electric Locomotives, Metropolitan Railway.

IN order to meet the demands of increasing train loads and accelerated timings, the twenty electric locomotives at present employed by the Metropolitan Railway for working non-electric rolling-stock over the electrified routes are being reconstructed, as shown by drawings on the opposite page. Originally, the motors had a power capacity of 800 h.p., but this is now increased to 1,200-h.p. There are four series-wound traction motors, each of 300-h.p. capacity, geared to the axles by means of single-reduction gearing. The motor is carried on the axle by means of suspension bearings, and a portion of the weight is transmitted by means of a nose on the motor casting which rests in a yoke sliding vertically up and down in guides fixed to the truck crossbar. A slight elastic support is obtained by means of rubber cushions.

Running wheels are of the disc centre type, having brake blocks acting on both sides of the rim. All pin joints in the brake gear are bushed with renewable bushes and case-hardened pins. The bogie frames are of solid construction and consist of plate frames well stiffened with cast-steel corner castings. Advantage has been taken of the latter for supporting the brake blocks and levers. Leading dimensions are: Length over buffers, 39 ft. 6 in.; length over body, 35 ft.; width of body, 8 ft.; height above rail, 12 ft. 4½ in.; bogie wheelbase, 9 ft. 3 in.; spacing of bogie centres, 20 ft. 3 in.; total wheelbase, 29 ft. 6 in.; diameter of bogie wheels, 3 ft. 7½ in.; gear ratio, 26/54.

High-powered electrical equipment is installed and arranged on supports in a central position down the cab of the locomotive, terminating in a main switch board at each end, the whole being surrounded by a handrail, leaving ample space on either side, thus rendering every piece of apparatus accessible for cleaning and inspection in the sheds. Control is of the "all electric automatic multiple-unit type," with sufficient stops in the master controller to allow of easy shunting. Below the electric equipment in the cab are situated two motor-driven vacuum exhausters and one air compressor, together with their respective reservoirs.

The Company's standard arrangement of brake tripping device is fitted, with an improved electrical interlocking arrangement as a safeguard, by means of which it is impossible for a driver to set his locomotive in motion without first having the brake apparatus ready for immediate application. To enable the driver always to have a clear vision in wet weather, automatic window wipers are fitted, operated from inside the cab. Either the vacuum or the air-brake apparatus is available for use according to the class of work engaged upon. Side louvres are provided in addition to roof ventilators.

In order to give more even haulage and acceleration, the locomotive is fitted with main-power positive and negative connectors for coupling up electrically with the passenger rolling-stock, which has been provided with through train lines with current collector gear on the first and last coaches. This provision enables the locomotive to collect current when the collector shoes on the locomotive itself are bridging gaps in the conductor rails.

The locomotives are being reconstructed at the Barrow Works of Messrs. Vickers, to whom the mechanical portion of the work has been entrusted, whilst the electrical equipment is being supplied and erected by the Metropolitan Vickers Electrical Company, under the direction and supervision of Mr. Charles Jones, the Railway Company's Chief Locomotive and Electrical Engineer.

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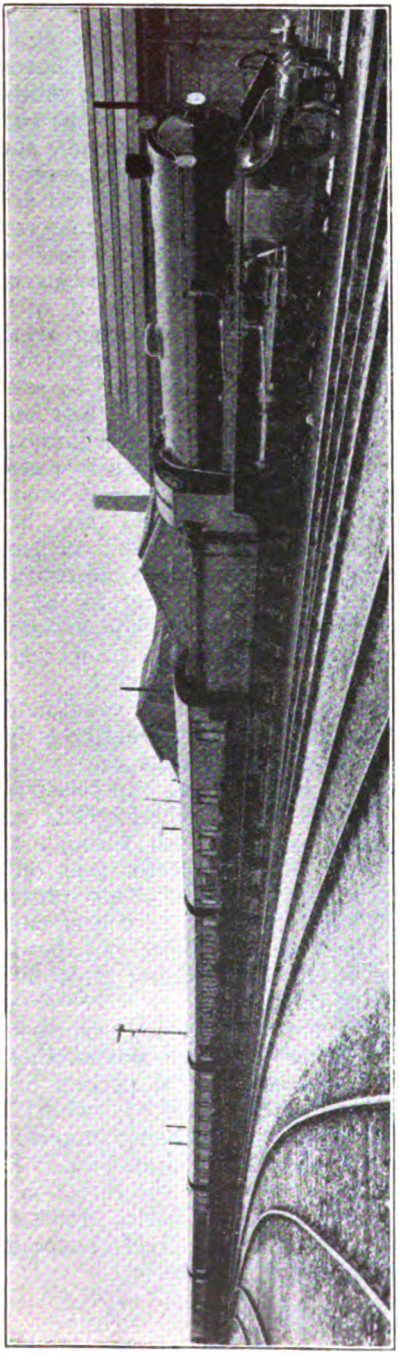
New Trains for Bournemouth Services.

LONDON & SOUTH WESTERN RAILWAY.



NEW TRAIN FOR BOURNEMOUTH SERVICES.

FOR use in London-Bournemouth trains which do not include restaurant car accommodation, four new trains have been constructed to the designs of Mr. S. Warner, O.B.E., Carriage and Wagon Superintendent, at the Eastleigh carriage and wagon works. Each consists of five coaches—at each end a third brake with four passenger compartments, lavatory and guard's and luggage section; one third-class with eight compartments and two lavatories; one first-class with seven compartments and two lavatories; and one "pantry third" with seven compartments, a pantry compartment and one lavatory. Total seating accommodation is for 42 first-class and 184 third-class passengers.

All vehicles are of side corridor design, with flexible gangways at each end to provide for communication throughout the train. Bodies and underframes are separate structures, and the principal dimensions are:—Length over buffers, 60 ft. 7 in.; length over bodies, 57 ft.; length over headstocks, 56 ft. 11 in.; centre to centre of bogies, 41 ft.; length of bogie wheelbase, 9 ft.; width outside waist, 9 ft.; width at cant rail, outside, 8 ft. 9 in.; height from rail to outside roof, 12 ft. 5 in.

Outside panelling of the bodies is entirely of galvanised steel, screwed to framing of teak and oak. The bottoms are framed with oak and the bays thus formed are fitted with galvanised corrugated steel, filled in with "Sanolit," which provides solid, hygienic, fireproof floors. The underframes are constructed of steel channels and angles, and the buffing shocks are absorbed by double buffers having indiarubber springs; the heads of the buffers are 16 in. diameter. Drawgear is of the usual type, fitted with three indiarubber springs at each end of the underframes behind the bolsters.

The bogies have four wheels and are of the London & South Western Railway standard type, with long bolsters, which

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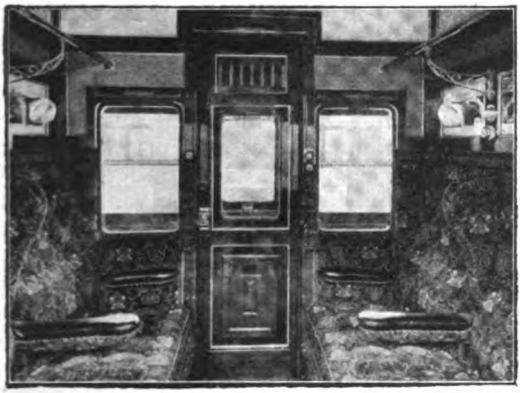


INTERIOR OF FIRST CLASS COMPARTMENT.

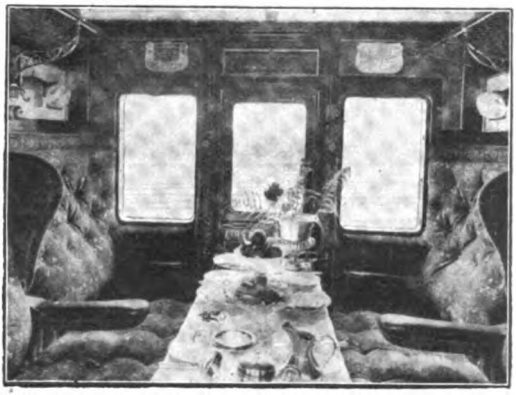
carry the side friction blocks out to the underframe solebars, thus reducing the oscillation of the coaches to a minimum. The top bolsters are supported on coil springs and the bottom bolsters are carried by means of swing links. Wheel-base is 9 ft., the wheels are of the solid steel disc type, 3 ft. 7 in. diameter, and the axles have 9 in. by 4½ in. journals, the centres of which are 6 ft. 8 in. apart. The laminated side springs are fitted with concentric indiarubber springs to further absorb shock.

One pantry is provided in each train, and fitted with convenient cupboards, drawers and shelves for storage of cutlery, crockery and food. A sink, with hot and cold water supply, is provided for washing-up purposes. A boiler, with a capacity capable of supplying tea, &c., to all passengers in the train on the journey, is fixed in the pantry, also an egg cooker and grill.

INTERIOR OF THIRD CLASS COMPARTMENT.

Electric light is fitted throughout the trains, the first-class compartments having two neat lamp brackets provided on each partition just below the parcel rack, also one lamp in the roof, and the third-class compartments are fitted with three lamps in the roof only. The corridors each have four roof lamps and the lavatories one. Ventilation is provided by means of drop lights in the sides of the vehicles with air extractors fixed outside above the drop lights and fitted with regulating shutters inside the compartments. Air extractors are also fixed in the roof of the pantry and vans for the purpose of providing additional ventilation in these compartments. Standard electric bell communication is fitted throughout the train.

Heating is provided by means of low-



INTERIOR OF FIRST CLASS COMPARTMENT WITH TABLE SET.

pressure automatically regulated radiators, which are fixed under the seats and supplied with steam from the engine. Provision is made for a portable table to be fitted in each compartment when required. The lavatories, situated at the ends of the corridors, have the walls lined with enamelled plates, the white ground of which is lined out as tiles and figures, with a neat design in blue. This material enables thorough cleansing to take place with a minimum amount of labour. A syphonic flushing cistern is fixed in each lavatory, and hot and cold water is supplied over the hand basin for washing purposes, the hot water being delivered from a steam water heater.

First-class compartments are trimmed with blue figured moquette and finished

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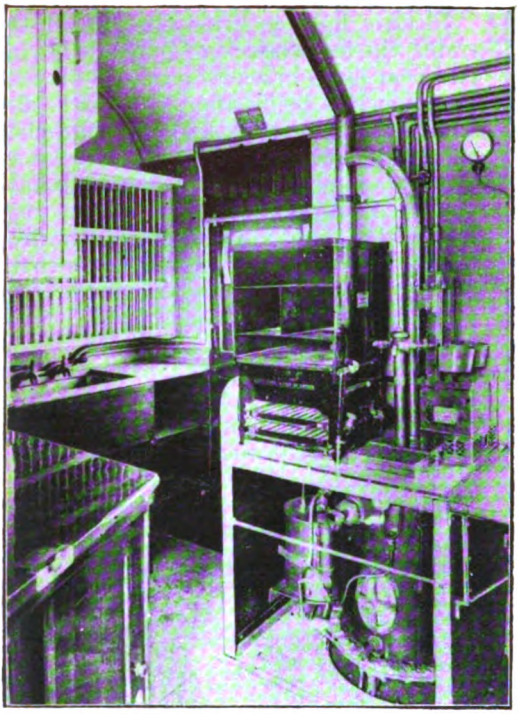

PANTRY SHOWING PLATE RACKS, SINK, BOILERS, ETC. AUTOMATIC EGG COOKER IMMEDIATELY UNDER STEAM GAUGE.

with polished walnut. The ceilings are formed with fireproof panel, and painted flat white, decorated with gold. Below the parcel racks, framed and fixed on the partition, are photochrom views of places of interest, a map of the London & South Western Railway system, and a bevelled edge mirror. The third-class compartments are trimmed with figured brown plush and finished with polished mahogany. The ceilings are similarly constructed to those in the first-class compartments, but less elaborately decorated. Photochrom views, a map and plain mirror are also fixed below the parcel racks. Spring roller blinds are fitted to all the passenger compartment windows, and brass hand rails are fixed across the large windows in the corridors, which latter are finished in polished mahogany and separated from the compartments by sliding doors, which have drop lights.

The guard's and luggage compartments in the third brake vehicles are 28 ft. 2¼ in. long and fitted with four pairs of hinged double doors. A set of emergency tools and a first-aid medical chest is fitted in each of these compartments. Owing to the loading gauge limit, the guard's look-outs cannot be made to project beyond the body; so, to obtain the necessary projection, the body of the van has been gradually decreased in width from 9 ft. to 8 ft. 3 in. in a distance of 7 ft. 10½ in. to within about 2 ft. 6 in. of the end of the coach, where it is again the full width, forming a projection in which a window is fixed thus enabling good views of signals to be obtained from the guard's seats.

The trains are equipped throughout with the latest fittings of the automatic vacuum brake, including passenger communication apparatus with "pulls" in the compartments and corridors. The vehicles are painted dark green, picked out with black, and lined yellow, and the lettering is in gold and black. The appearance of the trains as a whole gives an impression of stability and comfort.

CORRIDOR OF FIRST CLASS CARRIAGE.

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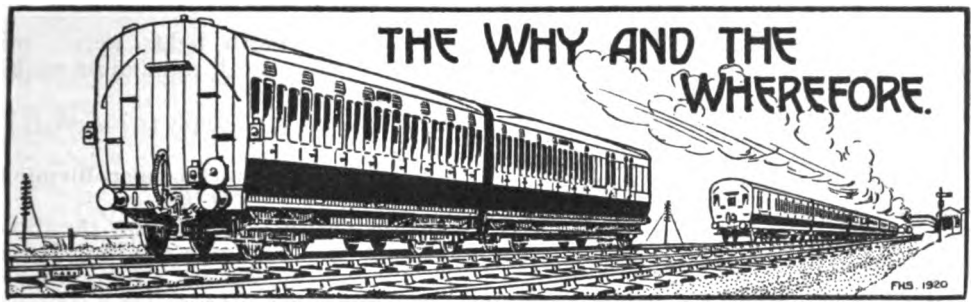

RAILWAY MAGAZINE *readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to locomotive sheds and to the dimensions of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. Queries respecting British Locomotive Practice and Performance should be sent to Mr. Cecil J. Allen, c/o* RAILWAY MAGAZINE, *30, Fetter Lane, Fleet Street, London, E.C.4. Queries should not be of purely local interest. No reader should forward more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history and the like, readers should consult the pages of the "Railway Year Book." The twenty-fourth Annual Edition of this standard railway reference work is now on sale, 5s. net, or by post from the* RAILWAY MAGAZINE *Offices, 5s. 9d.*

Swansea District Lines, Great Western Railway.

Freight traffic to and from Llanelly and points west thereof and points east of Neath is carried over the new route via Llangennech and Felin Fran, in order to avoid the Cockett inclines, and minimise congestion round Landore. Goods trains to and from the main line and Swansea North Dock is worked via Landore and North Dock Junction; that to and from the East and South Docks via Jersey Marine. In the latter case, if the trains are proceeding in the Cardiff direction, they cross the river at Neath and join the main line at Court Sart Junction; if to the Aberdare district, they continue direct through Neath (Low Level); and if to west of Swansea, they take the connecting spur to the new line at Felin Fran.

[Reply to "SILURIAN."]

Conductor Rails on Electric Railways.

Arrangements have been devised to enable electric trains, such as those of the Central London Railway, to take current either from a centre or a side conductor rail, and though they have not yet had to be adopted they would suit the conditions which will apply when the Central London is connected with the London and South Western Railway. Both use running rail return, so that there is no complication due to the use of a central negative conductor as on the Metropolitan District Railway, though part of the route to Richmond is thus equipped for the benefit of District and London and North Western Railway electric trains.

[Reply to H. C. B. HILL.]

"Double-Single" Tickets, London and South Western Railway.

As a war economy measure the London and South Western Railway introduced the practice of printing two single tickets together in the form of a return ticket, except that each half was for the same journey. The same serial number was used for each section, but a distinct classification number on the face of the ticket differentiated the two sections. They were usually issued when two single tickets were asked for, but could be cut in half and issued or used separately. The practice has been continued to some extent: hence the ticket you received, printed with the revised fare.

[Reply to "Z."]

North Eastern *v.* North British 4-4-2 Express Engines.

Nominal tractive effort of the North British Railway "Atlantics" is 22,000 lb., at 85 per cent. working pressure, as against 16,600 lb. in the case of the "V" class 4-4-2 engines on the North Eastern Railway. The larger piston area, higher working pressure and smaller driving wheels in the former case all contribute to this disparity. As previously emphasised, however, care should be taken

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in drawing deductions from such purely empirical figures, as they take no account of steam-producing ability.

[Reply to "ABERDONIAN."]

Freight Train Routes, Cardiff-Stourbridge Junction, Great Western Railway.

The lay-out at Honeybourne enables a through run to be made via Gloucester, Cheltenham, Honeybourne and Worcester, or the Newport-Pontypool Road-Hereford-Worcester route is followed, as may be most convenient. To the Birmingham area the bulk of the mineral traffic is conveyed via Honeybourne and Stratford-on-Avon. At the South Wales end the Hereford and Honeybourne routes converge at Maindee West Junction, ½-mile east of Newport.

[Reply to "SILURIAN."]

2-8-0 Engines on Caledonian Railway.

There are at present a number of 2-8-0 engines of R.O.D. (Great Central) design at work on the Caledonian Railway. As in the case of the majority of lines temporarily employing locomotives of this type, the Caledonian 2-8-0's are regarded as on loan merely, and therefore do not figure in the returns of locomotive stock included in the RAILWAY YEAR BOOK, nor in the tables of locomotive stock given in the July instalment of "British Locomotive Practice and Performance."

[Reply to A.R.M. and "ABERDONIAN."]

Railways of South America.

In a north-westerly direction the railway from La Paz in Bolivia is continued into Peru, past the Lake Titicaca to Cuzco, with a branch from Juliaca down to the sea at Mollendo, via Arequipa. The only railway communication between the Argentine Republic and Bolivia is by the Transandine Railway from Argentina into Chile, and then northwards by the Chilean coast system, ascending finally from Arica to La Paz.

[Reply to "LANCASTRIAN."]

Green Headlights.

Green headlights are employed by the Great Eastern and South Eastern & Chatham Railways in consequence of it being impossible adequately to indicate the routing of trains over systems of such complexity by the use of white lights only. Although we agree that the employment of white lights is preferable, we should not say that green lights were "misleading," and can call to mind no mishap caused thereby.

[Reply to F.A.W.B.]

Great Western Railway London-Birmingham Service.

All the best expresses follow the direct route out of Paddington *via* Park Royal, with the exception of the special morning express during the height of the season to North Wales resorts, which calls at Ealing Broadway, and travels thence by the West Ealing spur on to the North main line at Greenford. For the first few miles out of Paddington the mile-posts are on the down side.

[Reply to ERNEST F. HUBERT.]

Speed at Manningtree, Great Eastern Railway.

Speed of expresses at this point varies considerably according to engine and driver; normally it may be said to vary from 60 to as much, occasionally, as 70 m.p.h., with an average of about 65. All the principal expresses on this railway are now hauled by 4-6-0 engines of the "1500" class, details of which accompanied the frontispiece plate in the July issue.

[Reply to H. R. DEAN.]

Three-Position Signals.

It is not *necessary* for these signals to rise rather than fall for "clear," but it is doubtless considered that the indication thus given is more readily distinguished thus, especially when the arm is in the vertical position. Furthermore, any mishap to the apparatus working the arm, involving a disconnection, causes the arm to fall to the danger position, and thus averts the possibility of accident.

[Reply to A. R. MIALL.]

Railways of the Isle of Wight.

High speed is a commercial proposition and can only be indulged in when it "pays." In so limited an area as the Isle of Wight there never could be sufficient traffic to make speed pay, let alone the fact that it is not called for on such short journeys. Consequently, the railways have been built on a modest constructional scale, suitable to the class of traffic that they have to carry.

[Reply to CHARLES WOODNUT.]

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Locomotive Balancing.

It is not possible for a coach wheel to be unbalanced, as it is symmetrical about the centre, and the same applies to all locomotive wheels except driving and coupled wheels. To the latter balance-weights are applied, fixed at the outer end of the spokes, in order to neutralise as far as possible the centrifugal effect of the revolving motion parts.

[Reply to J.G.F.]

Tractive Force of Locomotives.

Your formula is correct for a 2-cylinder simple locomotive; in the case of a 3-cylinder simple multiply by 1·5, and of a 4-cylinder simple by 2. It does not in the least matter what unit of measurement is employed, provided the same unit is used throughout; it is most convenient, of course, to use the inch.

[Reply to "HAZELDEAN."]

Single-Driver Express Engines.

All the 4-2-2 type engines on the Great Western Railway have now been scrapped. Doubtless when the "Lady of the Lake" 2-2-2 singles on the London and North Western Railway were scrapped, the name-plates were broken up at the same time, as there would be no further use for them.

[Reply to "ENQUIRER."]

Locomotive Lists.

These cannot be given, neither are they issued officially. Other than those published privately, of which we have already given particulars several times, it would be necessary to collect data from many sources, or to get in touch with someone who has already done the work.

[Reply to W. K. NASH.]

The Largest and Heaviest Locomotive.

In answer to this evergreen query, which has already been answered many times, the Great Western Railway 4-6-2 No. 111, *The Great Bear*, takes the palm in this country with a gross weight (without tender) of 98 tons. This is the only British 4-6-2 tender engine.

[Reply to P.W.H. and others.]

Great Eastern Locomotive Numbers.

Large numerals are now being painted on the tender or tank sides of engines engaging in goods traffic on this railway, in connection with the system of traffic control inaugurated on July 11. We cannot say if the practice will be extended to passenger engines.

[Reply to "0-6-0."]

Locomotive Cut-Off.

Percentage of cut-off is always fully under the driver's control by means of suitably designed valve-gear. We fear we cannot devote space here to the explanation of so elementary a feature of locomotive construction; consult a text-book on the subject.

[Reply to "PEACOCK."]

Slide-Valves and Superheated Steam.

It has been a common practice with several railways, in superheating engines of types already existing, to retain the ordinary slide-valves; no difficulties are experienced in working, provided that efficient arrangements are made for lubrication.

[Reply to G. B. DREW.]

Lancashire and Yorkshire Railway. Rebuilt 4-6-0 Engines.

On the basis of nominal tractive effort these are the most powerful express engines in this country. But you should not lay too great stress on a result which is calculated by formula without reference to capacity for production of steam.

[Reply to "L. and Y."]

London and South Western Railway 0-6-0 Locomotives.

Mr. G. W. Vail writes that 0-6-0 locomotive No. 316 has been superheated, and is stationed at Nine Elms. Also that several engines of the "736" class are now using oil fuel, oil storage plant having been erected at Nine Elms.

[Further reply to "443."]

Routing of Continental Trains, South Eastern and Chatham Railway.

You are correct in stating that the route via Bickley and Orpington was meant in our former reply. Your further remark that these trains frequently take the Swanley and Maidstone route is also noted.

[Reply to A. F. WALLIS.]

Single Line.

Between Malton and Whitby the only single line section is from New Bridge Quarry to Levisham (between Pickering and Goathland). Severn and Wye Joint Railway is entirely single except from Sharpness South Box to Berkeley Road.

[Reply to A. R. MIALL.]

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Junctions at Newbury.

The Didcot, Newbury and Southampton Railway joins the Great Western Railway main line on the London side of Newbury at Newbury East Junction, and leaves it again on the west of Newbury at Enborne Junction.

[Reply to A. R. MIALL.]

Rail-Motors, Great Western Railway.

Your information as to the withdrawal of these combined engines and coaches from service is inaccurate, except in so far as they are not now employed to the same extent in the London area as heretofore.

[Reply to "PEACOCK."]

Non-Smoking Compartments.

Besides the South Eastern and Chatham Railway, the North Staffordshire in England, and the Dublin and South Eastern in Ireland, now label "non-smoking" instead of "smoking" compartments.

[Reply to J.M.R.]

Great Western Railway Locomotives and Rolling-Stock.

We understand that new 4-6-0 locomotives under construction will be of the four-cylinder type. We are not aware that any change in the painting of passenger carriages is contemplated.

[Reply to "MOGUL."].

Locomotive Power Classification, London and South Western Railway.

We have frequently explained that the letters on the side of London and South Western engines, adjacent to the buffer-beam, indicate a classification on a power basis.

[Reply to EDWARD WAIGHT.]

Pullman and Sleeping Cars, London and South Western Railway.

Sleeping cars belonging to this railway have been disposed of to the Great Western Railway. Pullman cars were run at one period, but their use ceased some time ago.

[Reply to J.G.H.]

Mail Traffic, North British Railway.

The North British Railway takes a considerable share in the conveyance of mails between Edinburgh and Perth, Dundee, Aberdeen and Glasgow, as well as between Glasgow and Edinburgh.

[Reply to "NORTH BRITISHER."]

Scottish Railway Signals.

Obviously there cannot be any great differences between the signals of the Caledonian and North British Railways, but each company has its own standards for posts, details and fittings.

[Reply to "NORTH BRITISHER."]

Up Mail Trains, Great Western Railway.

The up postal train leaving Penzance at 6 p.m. is due at Paddington 4.5 a.m. the next morning; it does not convey passengers. This is the only train answering to your description.

[Reply to "SHOOTING STAR."]

4-4-2 No. 1300, Great Northern Railway.

Built originally as a compound by the Vulcan Foundry Company at Newton-le-Willows, Lancs., this engine has since been re-built at Doncaster as a two-cylinder simple.

(Reply to P.W.H.)

The Great Western Railway at Bruton, Somerset.

We know of no reason why a junction should be made between this line and the S. and D. J. R. at Cole, nor can we say what traffic would pass over it if made.

[Reply to "BRUTON."]

Great Western Railway 4-6-0 Engine "Kirkland."

This was named after a director of the G.W.R. at that period. Remainder of your query is hardly suitable for reply in a railway periodical.

[Reply to "QUENTIN DURWARD."]

Great Western Railway Locomotive Classifications.

There are several different classifications of locomotive power in use on this railway, but the details are too numerous to enter into here.

[Reply to "HAZELDEAN."]

Caledonian Railway 4-6-0 No. 903.

The name "Cardean" has been removed from this engine. March, 1921, RAILWAY MAGAZINE recorded that three-cylinder 4-6-0 engines are building for this railway.

[Reply to "TEN-WHEELER."]

Condensing Tank Engines.

The U-pipes on the tanks of these engines provide a space for air entrapped as the tanks are filled and which may thus be compressed until the water level falls.

[Reply to D. CAMPBELL.]

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Buffer Stops.

Timbers attached to buffer-stops at dead-ends are provided for strengthening purposes, and to take the violence of the first impact, should it occur.

[Reply to D. CAMPBELL.]

Shrewsbury-Hereford Line.

Locomotive running over this route has been dealt with in "British Locomotive Practice and Performance" on a number of occasions.

[Reply to "BRUTON."]

Hump Marshalling Yards.

We note that Rugby should be added to the list of London and North Western Railway goods yards where "nump" shunting is practiced.

[Reply to C. R. CLINKER.]

Great Western Locomotive Chimneys.

New chimneys on this railway are of somewhat smaller diameter than those previously standard, and taper inwards from the top down.

[Reply to "0-6-0."]

Rhondda and Swansea Bay Railway.

See article in March, 1914, RAILWAY MAGAZINE. We cannot say who was responsible for the design of the locomotives you mention.

[Reply to T. J. NEILSON.]

Slip Carriages.

No information as to which railway first introduced slip carriages. Possibly some reader can oblige, or a reply may be given later.

[Reply to "Z."]

New Mills and Hayfield, Midland Railway.

This line was opened in 1902 to give the Midland a better approach to Manchester Central station *via* Heaton Mersey instead of *via* Marple.

[Reply to S. COWAN, JUNR.]

2-4-0 Engines, London and North Western Railway.

A number of both the 6 ft. and 6 ft. 6 in. engines are still at work (135 in all), and are confined principally to branch lines.

[Reply to "ENQUIRER."]

Great Central and London and North Western Connection at Rugby.

We know nothing of such a connection; it was probably a wartime proposal which did not ultimately mature.

[Reply to "PRECURSOR."]

2-6-2 Tank Engines, Lancashire and Yorkshire Railway.

These are employed on subsidiary duties, such as banking, marshalling, &c. Two have been broken up.

[Reply to "INQUISITIVE."]

Exmouth Branch, London and South Western Railway.

Between Topsham and Exmouth this line is worked on the Electric Train Tablet Block system.

[Reply to J.G.H.]

Oil-burning Locomotives.

Many railways are equipping engines for oil fuel, but we cannot afford space for lists of individual locomotives.

[Reply to "SIDCOTIAN."]

0-4-4 Tank Engines, Midland Railway.

Weight in working order, 53¼ tons. Water capacity, 1,270 gallons. Coal capacity, 42 cwt.

[Reply to JOHN K. KITTO.]

2-6-0 Locomotives, Great Western Railway.

We understand that all 2-6-0 engines on order for this line are of the "6300" class.

[Reply to T. J. NEILSON.]

North Eastern Railway Locomotive Classes.

See J. S. Maclean's book, "The Locomotives of the North Eastern Railway."

[Reply to C. B. FIRTH.]

London & North Western "Precursors."

Heating surface of the non-superheated engines is 2,009 sq. ft. in all, as you state.

[Reply to C. L. BETTS.]

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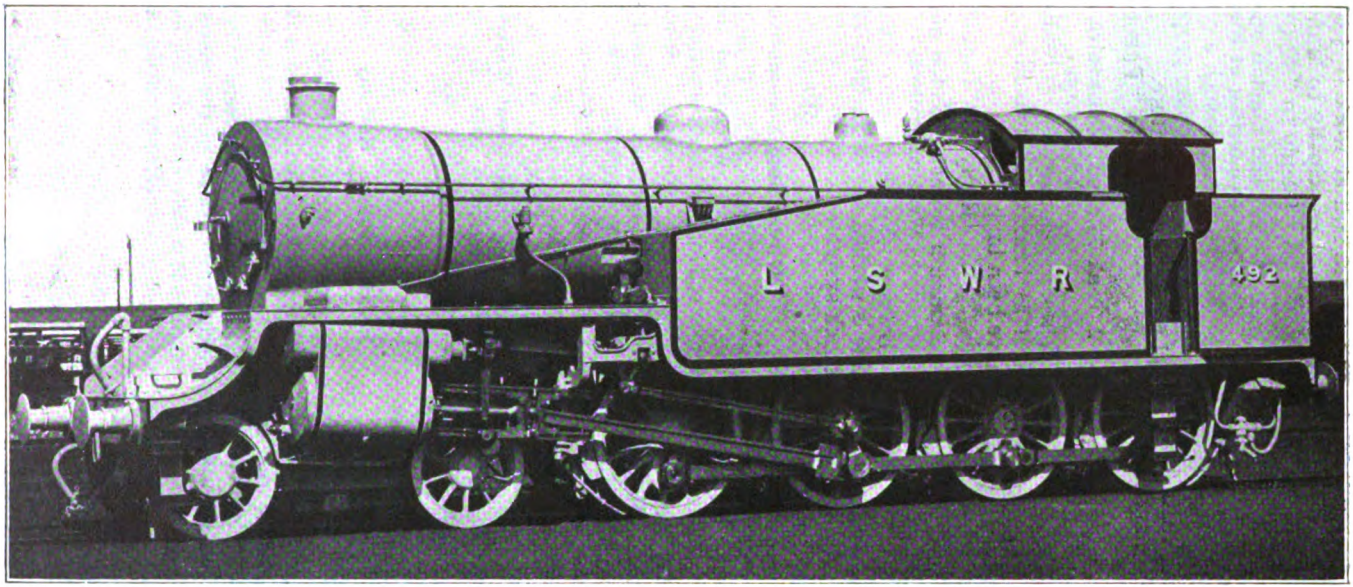
4-8-0 SUPERHEATER TANK ENGINE, LONDON & SOUTH WESTERN RAILWAY.

Mr. R. W. URIE, Chief Mechanical Engineer.



PARTICULARS, with line diagrams, were given in the February, 1921, RAILWAY MAGAZINE of 4-8-0 and 4-6-2 tank engines then under construction at Eastleigh Locomotive Works for use, primarily, in connection with the marshalling and operation of goods and mineral traffic at the new concentration yard at Feltham. The first engine of the former class is now completed, and by courtesy of Mr. R. W. Urie, Chief Mechanical Engineer, is illustrated above. Leading dimensions are: Cylinders, 22 in. by 28 in. Coupled wheels, 5 ft. 1 in. diam. Bogie wheels, 3 ft. 7 in. diam. Heating surface—small tubes, 910 sq. ft.; large tubes, 357 sq. ft.; firebox, 139 sq. ft.; Eastleigh superheater, 231 sq. ft.; total, 1,637 sq. ft. Grate area 27 sq. ft. Steam pressure, 180 lb. per square inch. Coal capacity, 3½ tons. Water capacity, 2,000 gallons.

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Photo.] GREAT WESTERN RAILWAY. [*C. T. Rowland.*

Up "Riviera Limited" near Teignmouth, hauled by 4-6-0 locomotive, "Knight of the Grand Cross."

Summer Train Services, 1921.

FOR many years an article under this heading was a special feature of every July number of the RAILWAY MAGAZINE, and but rarely did a year pass without calling for reference to many notable developments in facilities and the inauguration of several new trains, frequently including lengthy non-stop runs or accelerated schedules of a more or less novel and outstanding character. During the war period deceleration and withdrawals were necessarily the order of the day, and neither in 1919 nor in 1920 was it possible for the railways to do more than to meet the pressure of the holiday months with only limited improvement upon the services of the later war period, and but few special facilities. Earlier in the present year it was understood that the summer of 1921 would witness many important developments, and an approximate return to the standards of train running characteristic of pre-war years; but the coal strike seemed as if it would preclude anything of particular importance occurring this year. Happily the crisis itself is over, though its influence will affect matters for a long time to come; but many railways quickly followed their temporary resumptions of trains withdrawn by announcements of summer train services, which include some of the anticipated developments and a good proportion of new facilities, with a few novelties which justify the restoration of "Summer Train Services" to the pages of the RAILWAY MAGAZINE. Coupled with them, too, are comprehensive excursion arrangements, weekly or fortnightly as well as day, which will be welcomed by holiday-makers for distant destinations or to whom the cost of travel is an important consideration.

CAMBRIAN RAILWAYS.

The summer train service operated from July 11. The 10.15 a.m. and 1.50 p.m. trains from Whitchurch with connections from Liverpool and Manchester are accelerated, a number of intermediate stops being deleted to give arrivals at Aberystwyth 20 minutes earlier in each case. A tea car runs on the latter train. A through train, with tea car attached, leaves Shrewsbury at 2.20 p.m. for Aberystwyth and Pwllheli, both portions conveying through carriages from Paddington. New trains leave Paddington at 9.50 a.m. and Aberystwyth at 12 noon, with luncheon and tea car attached, arriving Aberystwyth at 4.15 p.m., Pwllheli 5.52 p.m. and Paddington at 6.30 p.m. respectively. A new train arrives at Aberystwyth at 8.25 p.m., with through carriages from Euston at 1.15 p.m., Manchester 2.15 p.m., and Liverpool 2 p.m. On Fridays additional trains conveying passengers at reduced fares are run from Paddington, Birmingham, Liverpool and Manchester, with bookings

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from various surrounding districts by ordinary trains into the through trains. Corresponding trains are run from Aberystwyth and Pwllheli for the return passengers. From South Wales bookings for reduced fare passengers are on Saturdays.

Great Central Railway.

Commencing July 11, the Great Central Railway re-introduced virtually its standard summer arrangements, including special through facilities to and from Stratford-on-Avon; through expresses from Sheffield to Southampton and Bournemouth, with a through carriage for Bradford; the Newcastle-Swansea restaurant car express, and the York, Nottingham, Leicester and Bristol trains; and the usual special facilities between Sheffield, Liverpool, Manchester, Leicester, Nottingham, &c., and Grimsby and Cleethorpes, together with the through services between Bradford and Bournemouth, to the Cambrian Railways, and various other holiday routes.

Special interest attaches to the new luncheon car express from Sheffield at 11.50 a.m. to Oxford, Southampton and Bournemouth, returning from Bournemouth West at 11.50 a.m., in each case with through coaches between Bradford and Sheffield. Comprehensive excursion facilities are given weekly, including special trains for 8 or 15 days, from the provinces to London, and similar trains in the reverse direction. There will also be a special train on Friday night from the North to the West and South of England and *vice versa*.

Great Eastern Railway.

Full summer services were introduced on Sunday, July 17, from which date accelerated expresses were run on various holiday routes, both week-days and Sundays. Additional restaurant and Pullman car facilities are provided on many trains, of which the principal are: 8.15 a.m. restaurant car express to Cromer and Yarmouth; 9.55 a.m. non-stop express to Yarmouth and Lowestoft; 10 a.m. restaurant car express to Cromer; and 10.12 a.m. semi-fast train to the East Suffolk line; 10.26 a.m. third-class Pullman car express to Clacton-on-Sea; 12.25 p.m. restaurant car express to Yarmouth and Lowestoft, and 12.30 p.m. restaurant car express to Cromer, the former stopping only at Ipswich to Beccles, and the latter at Ipswich and Norwich; 12.36 p.m. Clacton and Walton express; 12.57 p.m. Yarmouth and Lowestoft express; 1.30 p.m. (Saturdays only) restaurant car express to Clacton-on-Sea; 3.10 p.m. restaurant car express to Cromer, and 3.15 p.m. Pullman car express to Yarmouth, both calling only at Ipswich to Norwich or Beccles; 3.20 p.m. restaurant car express to Felixstowe; 3.23 p.m. express to Clacton-on-Sea; 4.55 p.m. Yarmouth restaurant car express; 4.58 and 5.30 p.m. restaurant car expresses to Clacton-on-Sea; 5.23 p.m. restaurant car express to Cromer; 6.39 p.m. Pullman car express to Clacton-on-Sea; 7.45 p.m. Ipswich express, and 8.45 Clacton and Walton express. On Sundays the 9.8 a.m. express to Clacton and Walton, and the 10.5 a.m. to Yarmouth and Lowestoft may be specially noted. On the Cambridge line the 8.30, 11.50 a.m., 2.34 and 5.49 p.m. trains are provided with restaurant cars for Hunstanton, while several ordinary expresses are run on the various services associated with this route. The Continental expresses leave Liverpool Street at 8.30 p.m. for the Hook of Holland, and at 8.40 p.m. for the Antwerp and (on Mondays, Wednesdays and Saturdays) the Zeebrugge steamers, both trains including first and second-class Pullman cars and restaurant cars. The Danish mail steamers for Esbjerg run in connection with the 3.15 p.m. train from Liverpool Street. Commencing July 15, 8 and 15 day excursion tickets are issued to all East Coast resorts and the principal inland towns in the Eastern counties. Day trips were inaugurated on July 11, daily or on specified days, to Southend-on-Sea, Clacton-on-Sea, Walton-on-Naze, Lowestoft and Yarmouth. For excursion and pleasure parties consisting of not less than 30 adult passengers or their equivalent, travelling together between any two stations for a day's outing, return tickets at a single fare and one-third are issued. An arrangement has been entered into with Messrs. Chas. Rickards, 10, Spring Street, London, W.2, under which they provide private horse and motor omnibuses for the conveyance of passengers and their luggage arriving at and departing from Liverpool Street station.

On Tuesday, Wednesday and Thursday, July 12, 13 and 14, special expresses were run between Liverpool Street and St. Pancras and Newmarket, on Tuesday and Wednesday from Liverpool Street at 9.50, 10,50 and 11.0 a.m. (the last-mentioned with restaurant cars), and from St. Pancras at 10.10 and 10.55 a.m. (the latter including first-class Pullman cars). On Thursday, the 9.50 a.m. from Liverpool Street and 10.10 from St. Pancras only were run. The announcements of these facilities indicate that no ticket restrictions now apply. The North Quay of Lowestoft harbour is being entirely re-constructed and brought up to date in every respect, the harbour itself at this point being dredged to a greater depth, thereby affording better accommodation for berthing of boats.

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GREAT NORTHERN RAILWAY.

The main features of Great Northern Railway train services commencing July 11 are the acceleration of Anglo-Scottish and other main line expresses; the reinstatement of through trains and vehicles between London, Glasgow, Perth and Inverness, with sleeping cars to each destination, as well as to Fort William; and the resumption of through trains between London and Middlesbrough, Hull, Harrogate, Scarborough, Whitby and Cromer. Incidentally the time between London and Leeds becomes 4 hours and Edinburgh 8½ hours (9.50 a.m. and 1.20 p.m. The principal accelerations and improvements may be summarised in regard to the following main line trains: 7.15 a.m., Leeds, due 11.20 a.m.; 9.50 a.m., Edinburgh, due 6.20 p.m.; 10 a.m., Glasgow, Perth and Aberdeen; 10.10 a.m., Leeds, due 2.10 p.m.; 1.20 p.m., Edinburgh, due 9.50 p.m.; 1.30 p.m. Leeds, due 5.30 p.m., again non-stop Peterborough to Doncaster; 1.40 p.m., York, Harrogate, Scarborough and Whitby; 3 p.m., Cambridge and Cromer; 4 p.m., Grimsby, Leeds and Newcastle; 5.30 p.m., Newcastle; 5.40 p.m., Leeds, due 9.40 p.m.; 6.5 p.m., Hull, York, Middlesbrough and Sunderland; 6.50 p.m., Inverness and Fort William; 7 p.m., Edinburgh and Aberdeen; 8.25 p.m. Edinburgh; 10.20 p.m., Glasgow, Perth and Dundee; 10.30 p.m., Edinburgh; 10.45 p.m. Newcastle. Several of these trains are booked from King's Cross to Peterborough in 87 minutes, while the London-Grantham non-stop time is 128 or 125 minutes, or 121 in the case of the 5.30 p.m. down. On Sundays there is the 11.30 a.m. down Edinburgh day express, the 12 noon to Leeds, &c., and the 5 p.m. to Leeds, Newcastle, &c., and the usual night Scottish trains. Return arrangements generally correspond. Several of the Anglo-Scottish trains are not publicly booked to call at York, but these special arrangements are covered in the North Eastern Railway section. From various provincial towns special expresses are run to Skegness, Bridlington, Filey, &c., also from Leeds and Nottingham to Yarmouth, Cromer and Lowestoft.

Photo.] GREAT SOUTHERN & WESTERN RAILWAY. [*R. Murphy.*
Dublin-Killarney express near Rathpeacon. 4-4-0 locomotive, No. 332.

Excursion arrangements include day trips on Sundays from London to stations as far as Peterborough; 8 and 15-day excursions on Fridays for North Eastern and Scottish stations by special train leaving King's Cross at 7.40 p.m., commencing July 15; on Saturdays, commencing July 16, from King's Cross at 10.15 a.m. for Norfolk, Lincolnshire, Nottinghamshire, Derbyshire, Yorkshire and North Eastern stations; together with corresponding arrangements from provincial stations and to London, and day trips as required by the various localities served. Day excursion fares are single fare for the

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double journey and for the period excursions (tickets can be obtained in advance, and this is requested when practicable) single fare and one-third. At the August Bank Holiday there will also be three-day bookings.

Great Western Railway.

Among the new services inaugurated July 11, the following may be noted: 9.15 a.m., daylight service to the Channel Islands via Weymouth; 9.25 a.m., to Taunton, Minehead, Ilfracombe, Torquay, &c.; 11 a.m., restaurant car express to Exeter and various destinations west thereof; 12 noon, non-stop restaurant car express to Torquay, due 3.50 p.m., with slip carriage connection at Taunton for Ilfracombe, &c.; 1.10 p.m., restaurant car express for Bristol and Weston-super-Mare, and to Tenby, Pembroke Dock, Milford Haven, Neyland, and other places in South Wales; 9.10 a.m., restaurant car express to North Wales; 9.50 a.m., restaurant car express (July 15 to September 17) to Welshpool, Aberystwyth, Barmouth and Pwllheli. Two and a quarter hour express trains between London and Birmingham are introduced, leaving Paddington at 9.10, 10.35 a.m., 2.15, 3.40 and 5.55 p.m. The 10.30 a.m. "Cornish Riviera" restaurant car express again runs on Sundays, and various other new facilities are provided on that day. First to announce summer period excursion arrangements, the Great Western Railway, the following were inaugurated on July 8, providing for return alternatively on Friday week or Friday fortnight: From Paddington at 8.22 and 11 p.m. for Taunton and West of England destinations; 2.5 p.m. for Newbury and stations to Weymouth; 7.10 p.m. for Chippenham, Bath, Bristol, Weston-super-Mare, Gloucester, Cheltenham, &c.; 11 p.m. for Chard, Wellington (Som.), Tiverton, &c., and 1.20 a.m. (early Saturday morning) for Newport and South Wales destinations.

The Great Western Railway has revived its well-known rail and river combined tours in the Thames Valley, also arrangements such as combined rail and motor coach trips to Burnham Beeches.

Highland Railway.

The principal feature of the services on this line is the resumption of through carriages and sleeping cars between King's Cross and Inverness, in abeyance throughout the war period; but the train arrangements include several matters of interest, though there are no outstanding developments. The through trains from England leave Perth at 5.50 a.m., reaching Inverness at 9.40 a.m. The mail train at 6.40 a.m. is due at Inverness at 10.15 a.m. The 11.50 a.m. from Perth, with through carriages from Edinburgh and Glasgow, travels via Forres, as in pre-war days, though Inverness can be reached in advance by the 12 noon semi-fast direct train from Perth. The 3.50 p.m. is also restored, reaching Inverness at 8.12 p.m. South bound trains leave Inverness for Perth at 8.10 a.m. (express), 10.30 a.m., 2 p.m. via Forres, 3.30 p.m. (express), 4.2 p.m. (sleeping car train), and 11.20 p.m. North of Inverness, the 6.30 and 10.30 a.m. run through to Wick and Thurso. South bound trains leave Wick at 8 a.m. and 2 p.m. Excursion arrangements to the Highlands again apply in connection with other railways in association.

Lancashire and Yorkshire Railway.

The summer services applying from July 11 represent the full programme of last summer with additions and improvements. "Regulation" applies in regard to traffic to Blackpool and Southport on Saturdays until September 24, and on Fridays from July 22 to September 16, and in the return direction on Saturdays and Mondays until September 26, and on Tuesday, August 2; also to Isle of Man traffic via Fleetwood on days when it applies to the Blackpool and coast stations. Other special features are the revived Continental service via Hull and Zeebrugge, the restaurant car services between Manchester (Victoria) and London (St. Pancras and Euston), with the through coaches between London and Blackburn, Colne, &c. Apart from the generous train services to and from Blackpool and Southport, which apply to all parts of the system, the following trains may be noted as of special interest: From Manchester to York, 9.50 a.m. (Saturdays only), 10.5 a.m. (Saturdays excepted), 12.15, 3.50, 5.10 and 7.30 p.m.; 9 a.m., Liverpool to York (Saturdays only); 10.20 a.m., restaurant car express Liverpool to York and Newcastle, non-stop Manchester to Wakefield; 2 p.m. from Liverpool to Hull and York daily, also to Hull (Riverside) for Continental traffic, and with through carriages from Preston on days when the Zeebrugge steamer runs; with special trains such as those for Llandudno at 3.25 p.m. to Bradford, the standard expresses between Liverpool and Manchester and Leeds and Bradford, through trains between Halifax, Sheffield and St. Pancras, and the corresponding return trains. Forty-five minute expresses are again provided substantially hourly between Liverpool and Manchester. Scottish services via Preston and London and North Western Railway, or Hellifield and Midland Railway, are provided on a very complete basis, with through carriages and restaurant cars on the principal services.

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LONDON & NORTH WESTERN RAILWAY.

Commencing July 11 the standard time for London-Birmingham expresses became 2¼ hours; London-Liverpool or Manchester, 4 hours; and the last vestige of traffic allocation disappeared, Edinburgh again becoming a principal Scottish destination for trains from Euston, in conjunction with the return of the morning Scotch express from Euston to its historic departure time of 10 a.m., accelerations and additional Anglo-Scottish facilities. Through carriages for Blackpool and Southport appeared on several trains from Euston; the restoration of the afternoon service to Aberystwyth and Central Wales, restaurant car services to North Wales; and improved Sunday facilities are also included. On the basis of departures from Euston station the following outstanding features may be reviewed: 9.15 a.m. (Saturdays excepted) for Birmingham and Wolverhampton, in addition to the present 9 a.m., which travels via Northampton, and running 10 minutes in front from Rugby onwards; 9.30 a.m. with through coaches for Blackpool and Morecambe; 10 a.m., Edinburgh, Glasgow (due 6.30 p.m.), Dundee and Aberdeen (due 10.40 p.m.); 10.25 a.m., 11.50 a.m., four-hour expresses for Liverpool and Manchester (first stop Crewe), with through coaches for Southport, Blackburn and Colne; 10.40 a.m. North Wales, Windermere and Keswick; 11.40 a.m., 2.5, 4.35, 6.50 p.m., 2¼ hour Birmingham and Wolverhampton expresses; 1.15 p.m., Central Wales, Aberystwyth and Windermere; 1.30 p.m., Glasgow, Edinburgh and Aberdeen; 2.30 p.m., Liverpool; 2.55 p.m., Manchester via Stoke; 4 p.m., Liverpool and Manchester; 4.45, Belfast boat train with through carriages for Blackpool, Barrow and Birkenhead; 5.20 p.m. four-hour express for Liverpool; 5.30 p.m., Manchester; 6.30 p.m., Holyhead; 7.30 p.m., Oban, Inverness and Highland Railway; 7.45 p.m., Stranraer, Perth and Aberdeen; 8.45 p.m., Irish mail; 9.20 p.m., Glasgow sleeping car express calling only at Stafford and Carlisle; 9.30 p.m., Holyhead sleeping car express; 9.40 p.m., sleeping car express for Edinburgh and Dundee, with through carriages from Birmingham; 11.40 p.m., Glasgow sleeping car express, and 11.45 p.m., Manchester sleeping car express. Commencing Sunday, July 17, a new train, which was not running prior to the war, was inaugurated, leaving Euston at 8 p.m. for Oban, Aberdeen and the Highlands. All these trains include breakfast, luncheon, tea, dining or sleeping cars as required. Corresponding improvements apply in the reverse direction. There are also many new trains for the holiday traffic to Llandudno, Blackpool, &c., from Birmingham, Liverpool, Manchester, &c.

Photo.] LONDON & NORTH WESTERN RAILWAY. [*G. W. Smith.*

Windermere express near Hest Bank. 4-6-2 tank locomotive, No. 802.

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London and South Western Railway.

London and South Western Railway summer services commenced on Sunday, July 10, the chief characteristic being the adoption of systematic services on each of the principal routes. Thus, Bournemouth trains leave Waterloo systematically at 30 minutes after each hour—at 7.30, 9.30, 10.30, 11.30 a.m., 12.30, 1.30, 2.30, 3.30, 4.30, 5.30, 6.30 and 7.30 p.m., the 10.30 a.m. and 12.30, 2.30, 4.30 and 6.30 p.m., being non-stop to Southampton West, restaurant cars being provided on the 11.30, 12.30, 4.30, 5.30 and 6.30 trains, while for the 2.30 and 3.30 p.m. trains the new rolling-stock, with provision for supplying teas and light refreshments, described on another page, is used. The Portsmouth route is served by trains at 5.50, 7.50, 8.50 (Saturdays only), 9.50, 10.50 (Saturdays only), 11.50 a.m., 12.50, 1.50, 2.50 (Saturdays only), 3.50, 4.50, 5.50, 6.50 and 9.50 p.m. Of these the 9.50 a.m. and 12.50 and 6.50 p.m. down trains convey restaurant cars. On the West of England services trains leave at 8 a.m., 9 a.m., 10 a.m. (North Cornwall and Bude), 11 a.m. (Ilfracombe and Plymouth), 12 noon (Sidmouth, Ilfracombe, &c.), 1, 3, 5 and 6 p.m., all except the 8 a.m. and 6 p.m. including restaurant cars, while the 10, 11, 12 and 3 p.m. trains are all non-stop to Salisbury in 95 minutes, the 1 p.m. calling only at Andover Junction and the 5 p.m. at Basingstoke. The 10 a.m. and 11 a.m. are also non-stop between Salisbury and Exeter, which is thus reached in 3¼ hours from London, while the 12 noon calls only at Yeovil, Seaton and Sidmouth Junctions. In each case corresponding arrangements apply in the opposite direction. A special feature this year is the introduction of through trains between Guildford and Bournemouth West, via Havant and Cosham, leaving Guildford at 12.40 p.m. and Bournemouth West at 11.30 a.m. The usual through services between Bournemouth and Birkenhead, Sheffield, &c., will again be run.

Eight and 15-day trips on Fridays were inaugurated on July 15, and on Tuesdays, commencing July 19, to Poole, Swanage, Dorchester, Weymouth, &c., and the Channel Islands; on Wednesdays, commencing July 20, to Basingstoke, Southampton, Brockenhurst, Lymington, &c., and on Thursdays, commencing July 21, to Christchurch, Boscombe and Bournemouth. Day excursion tickets were issued from July 18 to Portsmouth and the Isle of Wight; on Tuesday to Bournemouth, &c., and on Wednesday to Winchester, Southampton, Brockenhurst, &c., while cheap day and half-day tickets are issued weekdays and Sundays by certain ordinary trains to riverside resorts and the Surrey hills.

London, Brighton and South Coast Railway.

Important accelerations and additions earlier in the year render the restoration of normal train services on July 8 a sufficient basis for the summer pressure. In fact, the timetable issued in the spring already covers the prospective additions to come into force in June and July, so that a new summer timetable was not necessary. There are, however, several additions now made which require reference, including the 11.35 a.m. from London Bridge to Littlehampton and Bognor; the Isle of Wight connections on Fridays and Saturdays off the 1.35 p.m. from Victoria; the 4.50 p.m. from London Bridge to Littlehampton, Bognor, Portsmouth and the Isle of Wight; and the 8.35 a.m. Sunday train from Victoria to Littlehampton and Bognor. Also the 8.40 a.m. from Portsmouth to London Bridge, 6.30 p.m. to Victoria, and the 6.0 p.m. on Sundays from Bognor and Littlehampton. During the restricted service the 10.5 a.m. from Victoria to Worthing was extended to Angmering; this service is now further improved, the 1.55 p.m. from West Worthing to Brighton and the 2.10 p.m. from Worthing to Victoria starting from Angmering at 1.42 and 2.7 p.m. respectively, while the 12.5 p.m. from Brighton is also extended to Angmering. In connection with the services already provided for, London, Brighton and South Coast Railway facilities are now very complete, and fast trains numerous, not only to coast resorts, but also to inland places such as Tunbridge Wells and Crowborough. Thus Brighton has down expresses, in 1½ hours or less, from Victoria at 9.0, 10.5, 11.0, 11.40 a.m., 1.0, 1.55, 3.10, 3.40, 4.25, 5.35, 6.35, 7.15, 8.35, 9.55 p.m., and 12.5 midnight; also from London Bridge at 11.50 a.m., 1.15 (Saturdays only), 1.20 (except Saturdays), 2.5, 4.0, 5.0 (except Saturdays), 5.8 (except Saturdays), 6.0 and 7.20 p.m. Many of these trains include first and/or third-class Pullman cars, while the 11.0 a.m. and 3.10 p.m. "Southern Belle" expresses and the 6.35 p.m. from Victoria, and the 5.0 p.m. ("The City Limited") from London Bridge are 60-minute trains. Through services by separate fast trains are given as required to Hove and Worthing. On the Eastbourne route the 5.5 p.m. from London Bridge is a 90-minute train, the 5.20 from Victoria is booked in 91 minutes, and the 6.40 p.m. in 93 minutes, while other trains are not greatly slower. The Portsmouth line, too, has special expresses at 11.35 a.m. and 1.35 p.m. from Victoria and 4.50 p.m. from London Bridge. Corresponding facilities apply in each case in the opposite direction.

Day excursion trips on Mondays, arranged

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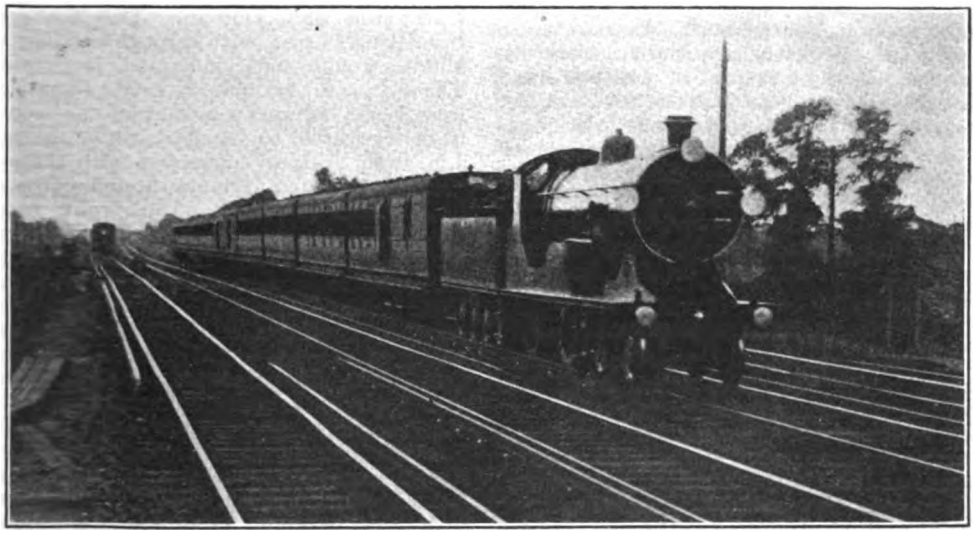
by Messrs. Thomas Cook and Son, were introduced on July 11, and Saturdays commencing July 16; by the National Sunday League on Sunday, July 10; Restall's trips on Wednesdays and Thursdays from July 13 and 14, the two former covering nearly all the seaside resorts served by the Brighton line, and the last-mentioned covering Brighton on both days and other places on Thursdays. On Wednesdays the Brighton company inaugurated 8 and 15 day trips on Wednesday, July 13, available to return the following Wednesday or Wednesday week. These arrangements apply also to Isle of Wight connections.

Midland Railway.

Commencing July 11, the 9 a.m. Anglo-Scottish train was divided, the Edinburgh portion leaving at that time and travelling via Nottingham and Sheffield and due at Edinburgh (Waverley) 6.36 p.m., the Glasgow train leaving at 9.35 a.m. and travelling via Leicester, due at Glasgow (St. Enoch) 7.5 p.m. The 11.45 a.m. Glasgow train leaves at 12 noon, and is accelerated to reach Glasgow at 9.25 p.m. Night services are also accelerated and divided as necessary to form the following trains:—9.15 p.m. to Edinburgh, due 7.15 a.m.; 9.30 p.m. to Glasgow, due 7.35 a.m.; 11.30 p.m. to Glasgow, due 9 a.m. The return trains leave Glasgow at 9.20 a.m., 12 noon, 9.15 p.m. and 10.40 p.m. (on Saturdays, 11 p.m.); Edinburgh, 9.10 a.m. and 9.45 p.m.; in each case with accelerated arrivals in London. A new express leaves St. Pancras at 1.20 p.m. for Bradford (Exchange), Halifax, Huddersfield, &c., calling at Nottingham, Sheffield and Thornhill. Also from Bradford (Exchange) at 10.55 a.m. for Sheffield, reaching St. Pancras at 4.10 p.m. The 5.35 p.m. from St. Pancras to Leeds leaves at 5.45 and conveys the through portion for Bradford, formerly attached to the 5 p.m. from St. Pancras, and arrives at Leeds 10.46. The 5 p.m. on week-days and 10.55 a.m. on Sundays (altered to 10.50 a.m.) to Leeds are accelerated, also the following up trains:—7 a.m. from Sheffield, 8.10 a.m. from Leeds (altered to 7.57), 9.26 from Sheffield (altered to 9.2 a.m.), 9.50 a.m. from Leeds, and 1.8 p.m. from Leeds (altered to leave at 1 p.m.). On the Manchester service the 2.30 a.m. from St. Pancras runs via Cheadle Heath, and is accelerated by 25 minutes; the 11.35 a.m. from St. Pancras to Derby leaves at 11.30 a.m., and is extended to Manchester, and a Liverpool connection is given at Chinley off the 4.15 p.m. to Manchester. Other trains accelerated are the 10.15 a.m., 12.15 p.m., 1.30 p.m., 2.15 p.m., 4.15 p.m., 6.15 p.m., and 12 midnight. The 11.50 a.m. Sunday express to Manchester leaves at 11.15 a.m., and a new express leaves St. Pancras at 3.15 p.m. Corresponding improvements in the up direction apply to the 1.10 and 8 a.m. from Derby, and 7.20, 9.20, 9.55, 4.35, 5.50 and 12 midnight from Manchester. In some cases the times noted are altered from those hitherto in force. A new express leaves Manchester at 12.10 p.m.,



LONDON & SOUTH WESTERN RAILWAY.

Up Bournemouth express near Raynes Park, hauled by 4-4-0 engine, No. 472.

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reaching St. Pancras at 4.25 p.m., with a Liverpool connection at 11.20 a.m. On Sundays the 12 noon and 5.15 p.m. from Manchester are accelerated trains. A number of these trains are non-stop between London and Leicester in 119 minutes, or London and Nottingham in 145 minutes. On the north and west main line many additional trains are run, several with through portions for Bournemouth, Weston-super-Mare, &c. The 9.43 a.m. Bradford to Bristol and Torquay leaves at 9.58, Leeds 10.30, and is accelerated to give an earlier arrival both at Bristol and Torquay. Special mention may be made of the Midland and London and North Western through services to Bournemouth, leaving Liverpool (Lime Street) at 9.45 a.m.; Manchester (London Road) at 10 a.m., and Birmingham (New Street) at 12 noon, for Cheltenham, Southampton, Bath and Bournemouth, together with the return train leaving Bournemouth West at 10.40 a.m. The Belfast boat train leaves St. Pancras at 5 p.m. instead of 3.20 p.m., and the steamer reaches Belfast 8.5 a.m. A steamer sails daily (Sundays excepted) from Heysham to Douglas and back until September 24. Numerous additional trains are provided on the various local routes, with special facilities as required for services such as those from Birmingham and Leicester to Yarmouth, &c., and on the Southend branch.

North British Railway.

In accordance with associated English railways, the timetables which came into force on July 11 represent not only a generous restoration of pre-strike services, but also a notable forward policy in regard to summer facilities. The North British is, of course, a party to the accelerated and increased Anglo-Scottish trains via the East Coast and the Waverley routes, the former including again, as in pre-war days, through carriages, restaurant cars, and sleeping cars between King's Cross and Glasgow, and Perth and the Highland Railway, as well as to Dundee and Aberdeen. Restaurant cars are run on the following trains:—Edinburgh to Glasgow, 7.40 a.m., 1.0, 2.0, 4.0 and 6.45 p.m.; Glasgow to Edinburgh, 7.42 a.m., 1.0, 4.0, 4.55 and 6.35 p.m., Edinburgh to Aberdeen, 7.40 a.m., 2.20 and 6.47 p.m.; and on Sundays, 7.40 a.m. Aberdeen to Edinburgh, 6.15 a.m., 12.50 and 7.15 p.m., and on Sundays, 2.40 p.m.; Edinburgh to Perth, 7.50 a.m.; Perth to Edinburgh, 12.30 p.m.; and of course the day trains on the Anglo-Scottish routes. Of purely North British interest are the Lothian Coast, Fifeshire Coast, and other expresses. The 4.22 a.m. from Waverley and 8.45 p.m. from Perth, with the Highland sleeping cars, are non-stop in 73 or 77 minutes. Between Edinburgh and Glasgow five trains are non-stop in 60 minutes. The North British is associated with the English companies for generous long-distance excursion facilities. The Clyde coast and other holiday districts are well served.

North Eastern Railway.

Commencing July 11, the 9.50 a.m. from King's Cross ceased to call at York for public traffic, while the 10 a.m., with through coaches for Aberdeen and Perth, also for Glasgow as in pre-war years, does not convey passengers between York and Newcastle. The 1.20 p.m. from King's Cross also omits York for public traffic, though it calls at Darlington, while the 5.30 p.m. restaurant car express from King's Cross to Newcastle omits York, though it calls to set down at Darlington and Durham. The 6.5 p.m. from King's Cross, with through carriages to Middlesbrough and Sunderland, is restored. The 8.55 a.m. train from Leeds (9.38 a.m. from York) becomes a restaurant car express from Newcastle to Glasgow, while the 10.5 a.m. from York, in connection with the 4.55 a.m. from London, conveys through carriages from York to Perth. The night trains leaving King's Cross at 10.20 and 10.30 p.m. are non-stop between York and Newcastle, while the 10.45 p.m. stops conditionally at York and at Darlington. Through sleeping cars for Inverness and Fort William are conveyed by the 6.50 p.m. from King's Cross, returning attached, in the one case to the 10.15 p.m. from Edinburgh and, in the other, to the 7.15 p.m. from Aberdeen. On Sundays through trains for Edinburgh leave King's Cross at 11.30 a.m. and Newcastle at 5 p.m., returning respectively at 10.10 a.m. from Newcastle and 11.30 a.m. from Edinburgh.

In the opposite direction the 10 a.m. from Edinburgh is not publicly booked at Newcastle, and the 10.15 a.m. from Edinburgh has through carriages from Aberdeen and Perth, and, as in pre-war years, from Glasgow also. The mid-day trains leave Edinburgh at 1.30 p.m., with through carriages from Aberdeen, while the 2.10 p.m. from Edinburgh includes through carriages from Perth to York attached at Newcastle to the 4.55 p.m. express to Liverpool, Lancashire and Yorkshire Railway. A restaurant car express from Glasgow and Edinburgh at 7 p.m. is run to Newcastle, connecting with the 10.50 p.m. to York and London. The night trains leave Edinburgh at 10 p.m. and 10.15 p.m., the latter omitting York for public traffic, while the 7.15 p.m. from Aberdeen is not publicly shown as calling at Edinburgh.

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On the Newcastle and Carlisle line fast and semi-fast trains are reinstated in each direction, through Stranraer expresses being non-stop to Newcastle at 12.40 a.m. and Carlisle at 1.10 a.m. (12.5 a.m. Mondays). Approximately hourly expresses are again run between Newcastle and Middlesbrough, while the usual through facilities to and from London and Leeds via Sunderland and Stockton are provided; also the through trains to and from the Lancashire and Yorkshire and London and North Western Railways via either the main or the coast lines.

Weekly and fortnightly excursion arrangements were inaugurated on July 15, together with local day and half-day trips, in many cases available by ordinary trains every day except Saturday.

North Staffordshire Railway.

The full summer programme became effective on July 11, and commencing July 15 weekly and fortnightly excursion arrangements were inaugurated, providing for bookings from North Staffordshire stations to the Lancashire, North Wales and Cardigan coast resorts, to the Lake District, North, South and Central Wales, the West of England, London, and to Scotland. To Llandudno the special train from Stoke is run from Stoke-on-Trent on Saturdays, and on Mondays, from July 18 to August 29 inclusive, this train leaves Stoke at 8.55 a.m. and calls at Crewe, though on the return journey, leaving Llandudno at 11 a.m., no stop is shown between Chester and Harecastle. In addition to this through train, through carriages are regularly operated on week days, except Fridays, from Derby at 11 a.m. to Llandudno, returning at 1.20 p.m. Very complete connections are made with the trains of associated railways, while the through London and North Western expresses to London, and the 12.20 p.m. from Manchester to Birmingham (9.25 a.m. from Birmingham to Manchester) give Stoke and the North Staffordshire system good main line facilities. On the various branches, and the Leek and Manifold Light Railway, additional services are provided as required to meet the needs of the holiday period.

South Eastern & Chatham Railway.

The services which came into force on Sunday, July 10, constitute virtually a return to pre-war speed, and to facilities on all important routes which will compare with the best offered by any company. There are also several important developments, notably, the inauguration of a Sunday "Thanet Pullman Limited" express, leaving Victoria at 10.10 a.m., due at Margate West in 90 minutes, at 11.40 a.m., and Ramsgate Harbour at 11.58 a.m., returning at 5.30 p.m., and due back at Victoria at 7.15 p.m. The inclusive charge, covering fare and Pullman supplement, is 24s. single and 42s. return. A special descriptive brochure has been issued in regard to this train.

Principal additions to the Kent Coast services, which include all features associated with last year's arrangements, which were themselves of a notable character, are:—10.15 a.m., Victoria to Ramsgate; 1.10 p.m. (S.O.) Victoria to Ramsgate; 1.55 p.m., Victoria to Ramsgate; 4.15 p.m., Cannon Street to Ramsgate; 12 midnight (S.O.), Victoria to Ramsgate; 6.15 a.m. (M.O.), Ramsgate to Cannon Street; 1 p.m., Ramsgate Harbour to Victoria; 2.40 p.m., Margate to Chatham; 5.50 p.m., Ramsgate Harbour to Victoria. On Saturdays a train leaves Herne Hill at 11.45 a.m., serving Beckenham and Bromley, and giving a fast service to the coast. The North Kent line is also served on Saturdays and Sundays by special through fast trains to Margate, &c. In regard to the Folkestone and Deal services the usual fast trains are reinstated, including the following:—10.15 a.m., London Bridge to Folkestone and Deal, &c., calling at East Croydon and Purley, with through connections from Reading; a return train for these places leaving Deal at 3.5 p.m.; a special fast train leaving Victoria at 9.45 a.m., calling at Bromley South and running via Maidstone to Folkestone and Deal, with a corresponding return train at 2.20 p.m.; 4 p.m. and 7 p.m., Charing Cross to Deal trains expedited to reach Folkestone in 85 minutes and Deal in about two hours; and the 11 a.m. and 5 p.m. up trains from Folkestone similarly expedited. The Hythe and Sandgate branch is reopened on Sundays with a limited service. In addition to the usual fast Hastings and Bexhill services, an additional business train leaves Cannon Street at 6.16 p.m., calling only at London Bridge, Tunbridge Wells, Wadhurst and Battle. In order to give a good service from suburban stations, the 12.25 p.m. from Charing Cross to Hastings runs via Beckenham and Bromley, with a corresponding return train at 6.15 p.m. from Hastings. On Sundays the 9 a.m. and 11.15 a.m. fast trains from Charing Cross to Hastings are reinstated, with similar fast up trains at 5 p.m. and 6.40 p.m.

Eight and fifteen-day excursions were inaugurated on Wednesday, July 13, while day trips are now operative on Sundays, Mondays, Wednesdays, Thursdays and Saturdays. There are also Restall Midweek trips.

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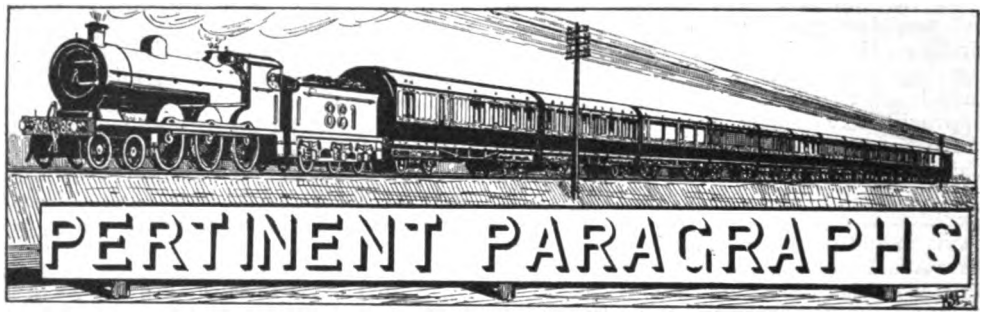

Heavy Locomotive Work on the Great Northern Railway.

OUR frontispiece, from a photograph specially taken by Mr. F. E. Mackay, shows one of Mr. H. N. Gresley's 2-6-0 three-cylinder locomotives, No. 1007, working a heavy express train consisting of no fewer than 18 modern bogie coaches, 8-wheeled and 12-wheeled. This performance may be compared with those recorded by Mr. Allen elsewhere in this issue; and in the September RAILWAY MAGAZINE, Mr. Chas. S. Lake will describe footplate experiences with these engines on such exceptional work. Meanwhile it will be sufficient to mention that the load of the train illustrated was 545·5 tons empty, there were 849 passengers and luggage, which represent a load of 605 tons as a reasonable computation, while these engines have, on occasions, hauled 20-coach trains, or more than 650 tons. The run was, of course, made during the coal strike period, this huge load resulting from a combined train, in this case the 10.58 a.m. from Doncaster to King's Cross. The two engines concerned, No. 1006, Doncaster to Peterborough, and No. 1007, thence to London, dealt with their train most capably on the ascending grades, and reached speeds of considerably over 70 m.p.h. on the downhill sections, and the small loss of time was due entirely to the need for drawing up twice at several stations, in view of the great length of the train, 1,126 ft., and station work.

Termination of the Coal Strike and "Summer Train Services."

WITH commendable promptitude most of the railways followed up the termination of the coal strike with announcements of restored trains, and during the first week of July particulars were available of either considerably amplified train services or of the "Summer Train Services," inaugurated generally on July 10 or 11, and in some instances of excursion arrangements also. Elsewhere in this issue the summer train services are reviewed, thus reintroducing a feature which for so many years figured so prominently in the pages of the RAILWAY MAGAZINE. Special emphasis may be laid upon the acceleration of London and Birmingham trains to 2¼ hours, and London, Liverpool, Manchester and Leeds trains to 4 hours, announced as in prospect by Mr. Allen some months ago; but of equal interest are the improvements in the Anglo-Scottish services, coupled with the fact that Euston becomes again a departure station for Edinburgh traffic, King's Cross for Glasgow, and both for other Scottish destinations, almost as in pre-war days. Other special features are the systematic and approximately hourly express services on various London and South Western Railway routes, the Great Western and Midland improvements, and the weekly and fortnightly excursion trains, inaugurated by the Great Western Railway as early as July 8, other companies following with similar generous provisions. In every way the summer services of 1921 represent a great step towards railway operation on the progressive lines characteristic of the pre-war period.

The Railways Bill in Committee.

CLAUSE 1 of the Railways Bill was carried by 45 votes to 5 at the sitting of the Committee on June 16, with an amendment to the effect that the Minister, before approving any variation in grouping, should give public notice thereof. The Committee rejected an amendment that any particular area should be served by at least two groups so as to preserve competition, as representing an impracticable requirement as, to be logical, it would call for the construction of new lines in many places, and it would be impossible to decide whether it had been satisfied or not.

On consideration of Clause 2 (1) there was discussion as to what length of time should be allowed to the companies to submit alternative amalgamation schemes. In the original Bill the time limit fixed was June 30, 1922, and the Minister of Transport was unwilling to extend it beyond six months,

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chiefly on the ground that the further the date were advanced the later would the trader get the benefit of the expected economies. On a division 1922 was struck out by 32 votes to 23, and by 46 votes to 8 the date adopted was June 30, 1923.

On June 21, a new subsection (4) was proposed to be added to Clause 2, providing that "any two or more constituent companies in any group may submit to the amalgamation tribunal a preliminary scheme for the amalgamation of such companies upon such terms as they may agree," and enabling that tribunal to make an order for such partial amalgamation. This amendment was accepted by the Government, subject to the addition that such submission must be made after June 30, 1922, and was agreed to, with that addition.

After discussion an amendment was carried against the Government (by 22 votes to 21) providing that any amalgamation scheme made in pursuance of the provisions of Clause 2 should not have effect unless approved by a resolution passed by both Houses of Parliament. Clause 2, as amended, was then agreed to.

Railway Amalgamation Finance.

CLAUSE 3, which deals with the provisions to be contained in amalgamation schemes under the Act, was then considered. An amendment to exclude canals, docks, harbours, hotels, &c., from the operation of the Bill, so that the only property to be vested in an amalgamated company should be that directly concerned with railway operation, was, after discussion, withdrawn. The Committee later agreed to an amendment enabling a skeleton company to be kept alive for two years after amalgamation, for distribution purposes only, so as to pass on to the stockholders of that particular company its share of net receipts from the group. The amendment also preserved the trustee character of a distributing company's stocks, which were in that category before amalgamation. Clause 3, as amended, was carried by 24 votes to 6, the minority including Sir Frederick Banbury and Sir Alfred Smithers, who protested against the amalgamation tribunal being empowered to "make such provisions as appear necessary or expedient with regard to the capital of the amalgamated company and the vesting of the property, rights, powers, duties and liabilities, whether statutory or otherwise."

AT the sitting on Wednesday, June 29, consideration was resumed of Clause 10, which provides for the payment of £60,000,000 to the railway companies in satisfaction of claims under the railway agreements and several amendments in detail were adopted, thus concluding Part 1 of the Bill.

Four Groups instead of Six.

ON Thursday, June 30, the Committee agreed to postpone the consideration of Clause 13 and subsequent clauses, and new clauses, until after the first schedule which sets out the grouping proposals. This schedule was amended by including in the Southern group the Bridgwater Railway Company and the South Eastern and Chatham Managing Committee, and excluding from it various non-working companies. With regard to the Western group, it was agreed in principle that the Alexandra, Barry, Cambrian, Cardiff, Rhymney and Taff Vale Railways should be constituent instead of subsidiary companies, provided that an amendment to be introduced later should save the trouble and expense of converting the whole of the Great Western stock. It was agreed to include the Festiniog Railway Company in the Western group. An amendment to exclude the Midland and South Western Junction Railway from that group was defeated.

On Monday, July 4, an amendment to omit the Midland Railway from the North Western and Midland group, and to make it the nucleus of a new central group, was negatived. The Derwent Valley, Calver and Bakewell Railway Company was excluded from the North Western and Midland group, to which were added the Caledonian, Glasgow and South Western and Highland Railway Companies.

On Tuesday, July 5, a long discussion took place on an amendment which proposed to make the Hull and Barnsley Railway a constituent company in the North Western and Midland group instead of in the North Eastern and Eastern group. This amendment was opposed by the Minister of Transport, who pointed out that the docks of the port of Hull would belong not to the North Eastern Company alone, but to the whole of the group, and that the running powers into Hull, which the North Western and Midland group now possessed, would be maintained. The amendment was defeated by 27 votes to 10. It was agreed that the name of the East Scottish should be addded to the North Eastern and Eastern group, and that the North British and the Great North of Scotland Railways should be constituent companies of that group. The committee also decided to include in the group the Mid-Suffolk Light Railway, while to each of the groups were added the minor companies previously associated with the respective Scottish groups originally proposed. The

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first schedule dealing with grouping was agreed to as amended.

On July 6, several hours were devoted to the discussion of a resolution designed to facilitate the progress of the Railways Bill by sending Part III of the measure (referring to railway rates) to a separate Standing Committee, leaving the existing Committee to continue consideration of the remainder of the Bill. The motion was strongly opposed and several amendments to it were discussed and rejected. In the course of the discussion, Sir Frederick Banbury questioned the Government contention that this was a very necessary Bill. He also contended that the division of the Bill between two Committees was impracticable. Major Hills deprecated the postponement of the Bill till an autumn session. Sir E. Geddes, Minister of Transport, said that the postponement would cause a state of financial chaos which would have serious effects on the community. As a compromise on one point the Government agreed to five days instead of three for the report and third reading stages of the Bill. The resolution, as amended, was ultimately carried by 184 votes to 99.

The Railway Benevolent Institution.

THE annual meeting was held on Tuesday, June 28, 1921, Mr. E. B. Fielden (Chairman, Lancashire and Yorkshire Railway) presiding.

In moving the adoption of the report and accounts, the Chairman said that it was with a sense of relief that he found they were in a position that he thought was satisfactory, as regards the income of the Institution. The accounts showed that during the year they were considering, they had received £93,975, as against £90,103 in the preceding year. In the year 1911, from donations and subscriptions, the amount received was £28,821: last year it was £31,471, or an increase of 9 per cent. Legacies in the former year were £3,036, and in 1921, £527—a decrease. Subscriptions from railwaymen, including the Casualty Fund, were £16,940 in the former year, and £21,671 in the latter year, an increase of 27 per cent. From interest and rents, the income in the former year was £28,615, and in the latter year £39,031, or an increase of 36 per cent. He thought those figures showed that those for whom the Institution was run appreciated the way in which it was managed, and the benefits that were received from it.

Railwaymen had increased their subscriptions, in the last 11 years, by something like 27 per cent., and, on the face of it, that looked like a very substantial increase. But when they considered that their numbers, in the last few years, had very materially increased, and that through the increase of wages granted to them they had not suffered to the same extent as the individual who received a fixed income, he thought they might reasonably look for a material increase in the receipts from that source.

In seconding the resolution, Mr. W. J. Grinling (formerly Chief Traffic Manager, Great Northern Railway) desired, first of all, to express regret at the absence of Sir Henry Thornton, Chairman of the Board, who was to have seconded that resolution. When Mr. Mills asked him (Mr. Grinling) to fill the gap, he showed him a resolution of the Board, appointing his father as a member of the Board, no less than 61 years ago. He had just come from the House of Commons Committee at Westminster, where there had been a good deal of talk about grouping, and tribunals, and other such matters, and where the weather was inclined to be stormy. It was a relief, therefore, to come back into the atmosphere of that Institution, which knew no groups, recognised no companies, made no distinction of grade or class, but whose one aim and object was the relief of distress. Mr. W. H. Hyde (formerly General Manager, Great Eastern Railway) proposed a resolution as follows:—"That the Right Hon. Lord Wolverton be re-elected Treasurer of the Institution." Lord Wolverton had been the Treasurer of the Institution since August, 1908, since which time he had been re-elected on every occasion. The resolution was seconded and carried unanimously. After formal business had been transacted, Mr. W. H. Hyde moved a resolution "That the most hearty thanks of the members of the Institution be and are hereby given to our President, Mr. E. B. Fielden, Chairman of the Lancashire and Yorkshire Railway Company, not only for his very successful advocacy of the claims of the Institution and valuable assistance in augmenting the funds on the occasion of the annual collection, but for his deep personal interest in its welfare." Mr. C. F. Graseman (Assistant to General Manager, London and North Western Railway) seconded the resolution, which was carried unanimously. The President suitably responded.

The North British Railway and the Ministry of Transport.

BY the unanimous decision of the Railway and Canal Commissioners in Edinburgh the Minister of Transport was ordered forthwith to pay to the North British Railway the sum of £430,000, withheld in respect of the claim for the month of December, 1920, under the railway agreements. This order was subject to the condition that the railway company should be liable to repay with

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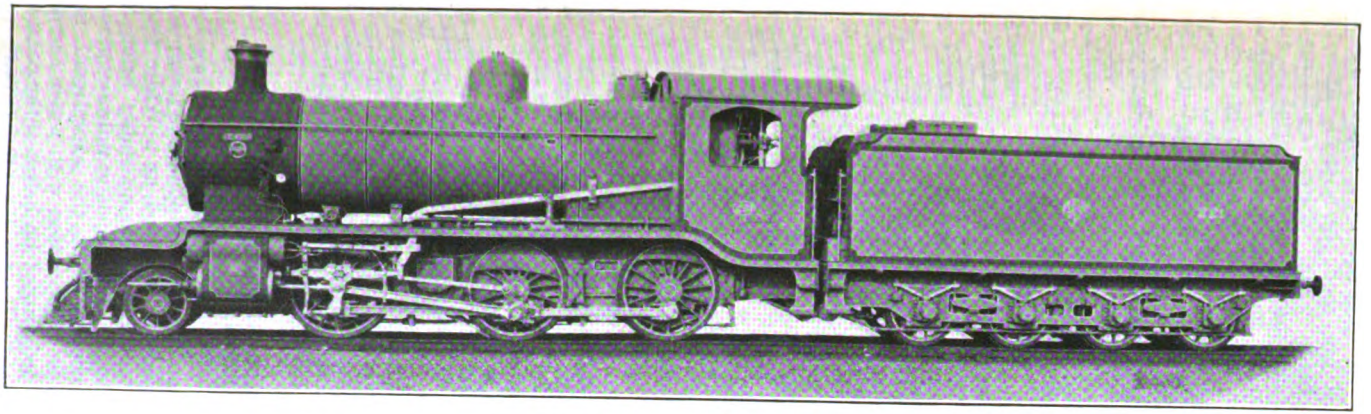
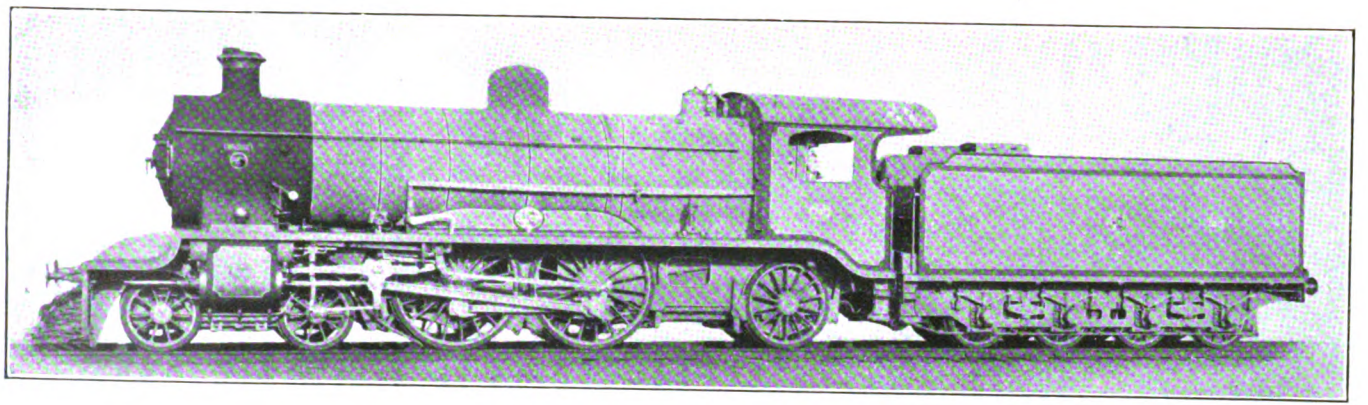


2-6-0 GOODS LOCOMOTIVE



4-4-2 EXPRESS PASSENGER LOCOMOTIVE.

NEW LOCOMOTIVES FOR THE EGYPTIAN STATE RAILWAYS.

BUILT BY THE BALDWIN LOCOMOTIVE WORKS, PHILADELPHIA, U.S.A.

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interest at 5 per cent. any sum in excess of the amount due. Thus, subject to any appeal that may be taken on a point of law, the company was declared entitled to receive the £430,000 withheld from its provisional claim for the month of December, 1920, but without prejudice to the final adjustment of the actual claims. Meanwhile the shareholders have been waiting for the payment of the balance dividends on the preference and preferred ordinary stocks and for the dividend for the year 1920 on the deferred stock.

It will be remembered that the Commissioners in May made an interim order for the immediate payment of the £430,000 conditionally on the company agreeing to repay any sum in excess of what might later be found to be due. On appeal by the Ministry to the Court of Session the interim order was recalled on the ground that in Scottish practice an interim decree for payment could not be made in respect of money part of which might become repayable. The Court of Session, however, held that there was a legal obligation on the Ministry to examine the monthly accounts, and to transmit the account, if passed, to the Treasury for payment, and order the Minister to lodge particulars of the grounds of objection to the items challenged in the December account. On these being lodged the case was remitted to the Railway and Canal Commissioners, who then gave their decision. The North British Railway has succeeded in establishing the main contention, that there is no limit to the quantum of repairs in any agreement between the railways and the Government. This decision about unlimited repairs is of great importance to all railway companies.

Baldwin Locomotives for Egypt.

LOCOMOTIVES of two interesting types have recently been supplied by the Baldwin Locomotive Works to the Egyptian State Railway Administration. They are built to British specifications throughout, and are of the 2-6-0 and 4-4-2 types respectively, the former for freight and mixed traffic, and the latter for passenger train service. Although differing in respect of wheel grouping and service classification, the locomotives have certain features in common, although here again variations in dimensions occur. Both engines have outside cylinders with superimposed piston-valve steam-chests, Walschaert valve gearing, Belpaire type boilers, and a common design of eight-wheeled tender, in which latter bogie trucks are not resorted to.

The locomotives are fitted with "cow-catchers" and ordinary type spring buffers and drawgear with screw couplings. The boilers are fitted with superheating apparatus, and in each case the working pressure is 160 lb. per sq. in. Copper interior fireboxes are used, with steel tubes, the latter being 2 in. diam. and 162 in number for the fire tubes, and 5⅜ in. diam. and 21 in number for the superheater flues, in the case of the 2-6-0 type engine, whilst the 4-4-2 locomotive has 28 superheater flues 5⅜ in. diam., and 156 steel fire tubes, 2 in. diam.

Leading particulars for the two classes are as follows:—

	2-6-0.	4-4-2.
Cylinders, diameter and stroke ...	21 in. × 26 in.	20 in. × 28 in.
Wheels, coupled, diameter... ...	5 ft. 0¾ in.	6 ft. 6 in.
Wheelbase, coupled	15 ft. 11 in.	6 ft. 10 in.
Wheelbase, total engine	24 ft. 2 in.	31 ft. 0½ in.
Wheelbase, engine and tender ...	52 ft. 0¼ in.	57 ft. 1½ in.
Boiler, diameter ...	5 ft. 3 in.	5 ft. 4½ in.
Thickness of shell plates	⅝ in.	⅝ in.
Heating surfaces—	Sq. ft.	Sq. ft.
Firebox	164	187
Tubes	1,135	1,259
Flues	397	608
Superheater ...	395	524
Total with superheater ...	2,091	2,578
Grate area ...	25	30·9

The tenders are of the eight-wheeled pattern without bogies. Water capacity is 5,500 imperial gallons, and eight tons of coal are carried. The 2-6-0 type engine weighs 68½ tons, of which 52½ tons are available for adhesion, the total weight with tender being approximately 120 tons. The passenger engine weighs close upon 80 tons of which nearly half ranks for adhesion, the weight, including the tender, being approximately 130 tons. The engines are fitted with Wakefield mechanical lubricators for valves and cylinders also for axleboxes, the same firm's patent anti-carbonising device being likewise applied.

Coastwise Shipping and Exceptional Railway Rates.

THE report of the Rates Advisory Committee on Coastwise Shipping and Exceptional Rates has been issued as a White Paper. The document is commendably brief, and must be held to justify railway practice in connection with the exceptional rates quoted in competition with water carriage. The remedy urged on behalf of the coastwise shipping trade was that the railway companies should be prohibited by statute from granting exceptional rates more than 20 per cent. below the class rates, and that all existing exceptional rates should be brought to that standard. The Rates Advisory

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Committee "do not consider this remedy practicable," and add that it is not the case that all exceptional rates more than 20 per cent. below class rates are due to water competition. "Very many inland rates show a similar cut, and the reasons for granting them are very various. Such a provision as that suggested would affect traders in varying degrees, and many would find themselves excluded from markets in which they have for many years done a large amount of business. It would certainly be opposed very strenuously by the trading community, as well as by the railway companies, and it would be difficult to find arguments to meet such opposition in Parliament. . . ."

"The true remedy," concludes the report, "is a reduction of the costs of carriage by sea, and particularly in the terminal charges." Upon the question directly referred to the Committee, viz., whether there is any solution of the problem by way of an immediate increase in the exceptional rates charged by railway companies in cases where there is competition with carriage by water, they cannot see any such solution *and are particularly of opinion that a direction or statutory enactment that no exceptional rate shall be allowed of less amount than 20 per cent. below the corresponding class rate is impracticable.*

"Our Abandoned Railways."

MR. R. J. KELLY, K.C. sends a cutting from the *Tuam Herald* containing an editorial article under this title, the chief plaint being that no reorganising Bill for Irish railways has been promoted, "but they are to be handed over to the Irish Council"—which "will probably never come into actual working existence." We may sympathise with the writer, but surely he is adopting the wrong view—there is no reason whatever why the grouping and reorganisation proposals should have omitted Ireland, except that (1) it is appropriately a matter for the Irish parliaments to deal with, and (2) that nothing of any tangible or definite value could be done under existing conditions. During the war it was appropriate that the Irish railways should be brought under the conditions of Government control and guarantee, but as compared with the British lines post-war difficulties in Ireland are not due to war causes in anything like the same degree as in Great Britain, and the Irish railway companies must face the situation that they will be decontrolled in August under disadvantageous conditions which are due solely to occurrences in Ireland itself. That is, indeed, the great trouble—that measures for dealing with the Irish railways on the lines proposed for Great Britain could not be advanced at this time with any satisfaction, and it is for Ireland to "put its own house in order," to end the distressful situation which is penalising railway companies and business concerns of all kinds. Had Ireland settled down to post-war conditions as in Great Britain there is little doubt that the Railways Bill would have included provision for Irish railways; with a new political organisation the proper course is for Ireland to deal with its own railway problems, but first to recreate conditions suitable for their solution.

Train Control or Traffic Control.

IT is somewhat unfortunate that almost the same terms are being applied to two radically different aspects of train operation, and we sympathise with those who argue that it would be better to use the term "Traffic Control" where systems of train control from control offices are in question. This view is, however, not entirely favoured, and some people would prefer to find a different description for "automatic train control" by means of train stop devices, &c., designed to ensure a correct relation between train movements and signals. It is a moot question as to which section has a prior claim to the use of the words "train control," but although most of the work of a control office is to organise or reorganise train working, its functions cover so many other aspects—wagon distribution, train-men's duties, engine movements, provision of wagons for loading, &c.—that the word "traffic" appears to be far more appropriate. In the case of cab signals, train stops and other appliances which come under the general description of "automatic train control," these do, at least, apply only to the movements of "trains"—passenger or goods, empty or loaded, or light engines—while their object is to associate the "instructions" of signals with direct indications or actual control devices on the engines.

Serious Railway Collision in Spain.

A DISASTROUS collision occurred between the Seville express and the Toledo-Madrid express at Villaverde, near Madrid, on June 11, in which there were 12 lives lost and 34 injured. Villaverde is a small junction 8 km. from Madrid on the Madrid, Saragossa and Alicante Railway main line. The Seville express, due out of Madrid at 8.20 p.m., left on time and is not scheduled to stop at Villaverde. The Toledo express is due at Villaverde at 7.38, but was running late, and only arrived there just as the Seville train was due to pass. As the Madrid, Saragossa and Alicante trains run on the right hand track, trains from the Toledo branch, which is single line, cross

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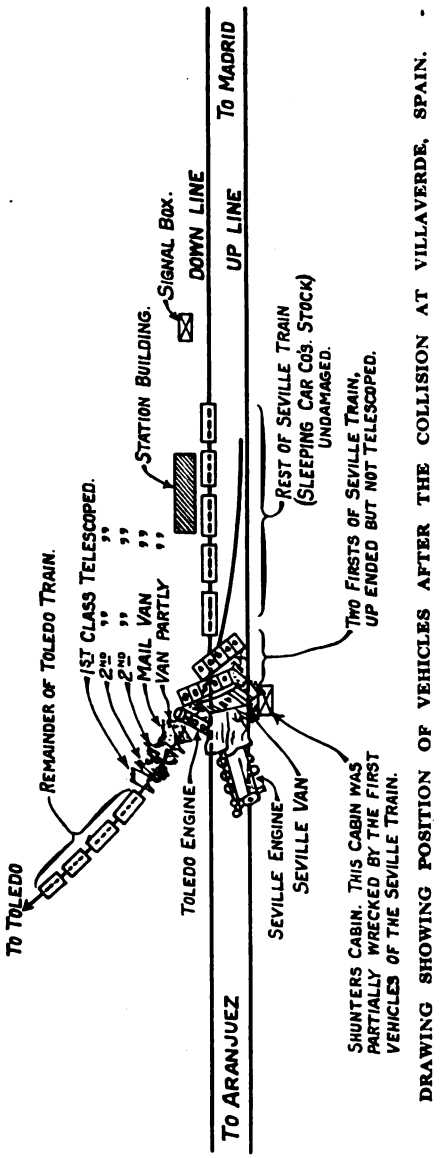
the down line to get on the up line and continue to Madrid. For this purpose both distant signals and points are interlocked so that "line clear" cannot be given simultaneously on main line and branch, in either direction. Apparently, however, the driver



DRAWING SHOWING POSITION OF VEHICLES AFTER THE COLLISION AT VILLAVERDE, SPAIN.

of the Toledo train overran his signals and stopped with his engine fouling the down main line at the precise moment when the Seville express ran into the station. The engine of the latter struck the Toledo engine practically head on, driving it back on to its train. The brake van of the Seville train mounted the overturned engine, and the two next first-class carriages followed, but the sleeping cars and restaurant cars were undamaged, and with the exception of the driver, who died at his post, and the mail sorter, there were no fatalities in this train. The Toledo train suffered much more. The terrific impact of the express engine drove the mail engine back into its train. The leading van was forced through the mail van following, and two second and one first-class coaches were all telescoped and reduced to splinters, the remaining vehicles, as in the case of the other train, escaping serious damage. Rescue work was rendered very difficult by the state of the wrecked vehicles, but fortunately there was no outbreak of fire.

The locomotive of the Seville train was one of the "900" class, weighing 130 tons, built for the Madrid, Saragossa and Alicante Railway by the American Locomotive Company in the present year. The engine of the Toledo train was a Maffei "800" class. Both these trains are well known to tourists who have travelled in Spain, and indeed, the Seville express, which is made up mainly of International Sleeping Car Company's stock, has always been considered one of the most comfortable trains in the world. The prompt and effective application of the brakes undoubtedly saved this train, which as a rule passes Villaverde Station at something like 50 miles an hour. As it was, the passengers in the dining cars were quite unaware of the magnitude of the disaster until they alighted and saw the wreck.

Denbigh Hall to Rugby in 1838.

WITH reference to our remarks under this heading published in the June RAILWAY MAGAZINE, Mr. K. O. Gurney, of Hemel Hempstead, writes:—"The road from Denbigh Hall to Weedon is a part of the Roman Watling Street, which was practically rebuilt and engineered by Mr. Telford, between St. Albans and Weedon, when making the Parliamentary and Mail Coach Road, from London to Holyhead. At the foot of Weedon Hill the Roman road keeps straight on, becoming a secondary lane and then disappearing for a short distance near Watford (Northants) and Kilsby, only a grass covered track remaining, while the Holyhead road ascends Weedon Hill and passes on through Daventry, Dunchurch, Coventry, &c. Prior to the late war, I cycled over this road and the stones referred to were then in existence, on a hill with a gradient of 1 in 21 for over half a mile, by the 65th milestone, between Foster's Booth and Weedon, just before the road passes over the north end of the short

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railway tunnel south of Weedon, and near the scene of the Weedon accident. I believe it is known locally as 'Heyford Hill,' and the stones are laid on the left-hand side of the road, uphill in the Weedon direction.

"I have referred to Cary's 'Roads and New Itinerary,' 1826, also Paterson's 'Roads,' 1828, and the latter gives the following:—'A new piece of road has been made by the Parliamentary Commissioners from the Angel Inn to near Weedon'; and in Mr. Telford's report of 1824 a plan is given for improving the road across the valleys between Foster's Booth and the 'Angel.' There is no mention of the stones being laid and I have never heard of them being laid the whole way between Towcester and Weedon. I have always been under the impression that they were laid on this particular hill for traffic going north, purely for humane reasons.

"With regard to the suggested competition on this section between the coaches and the railway, I would point out that Messrs. Chaplin and Horne, who up till 1838 were separate proprietors, amalgamated when the railways began, and instead of competing entered into a contract with the company and maintained the service of coaches from Denbigh Hall Inn to Rugby Station. They also acted as agents for the London and Birmingham, and the Grand Junction railway companies, booking passengers and parcels from certain of their Coaching Inns in London, as under:—Spread Eagle, Gracechurch Street; Golden Cross, Charing Cross; Swan-with-two-Necks, Lad Lane; Cross Keys, Wood Street; George and Blue Boar, Holborn; Spread Eagle, Regent Circus. These are now London and North Western Railway town offices. Their omnibuses left these Inns three-quarters of an hour before the departure of each train. The firm also had an office at Euston Station for the purpose of transacting their business generally in connection with the company and for booking passengers to various parts of the country, via railway and on by coach. The terms 'Booking Office' and 'Coaching' are in general use to-day in respect of passenger traffic.

"The 'Iron Road Book,' edited by F. Coglan, 1838, states that 48 miles were open from London, and 29 miles from the Birmingham end, and the distance from Denbigh Hall to Rugby by road 37½ miles, giving a total of 114½ miles, which was reduced to 112½ miles when the line was completed. Describing places on the route the following is given:—'Bletchley, a small miserable village, where those disappointed in getting on from Denbigh Hall must not expect to find accommodation even for their dog. In the enclosure of the heath an allotment of 25 acres was assigned for the benefit of the poor, in lieu of cutting furze.'"

The original querist, Mr. G. W. Bishop, also writes: "Many thanks for the information which you have kindly given in the June RAILWAY MAGAZINE concerning the Denbigh Hall and Rugby section of the London and Birmingham Railway. It now seems certain that the road coaches ran over Watling Street. The association between Roman roads and the routes of the early railways should prove to be an interesting subject. May I mention another curious link between the Romans in Britain and the London and North Western Railway? I refer to the company's well-known coat-of-arms. In a book called 'The Romance of Early British Life,' it is stated that Carausius, Commander of the Roman Fleet and Emperor of Britain (A.D. 286–293), made coins stamped with the figure of Britannia holding a trident. This was to show the supremacy of Roman Britain on the sea. The old-time Emperor would little dream of the future destiny of his device!"

Lt. L. D. Ambrose, R.F.A., writes in reference to the "Stoneways" between Towcester and Weedon: "Last year I was stationed at Weedon and frequently passed two stretches of such stoneways, about three miles south of Weedon, near a village called Cold Higham, on the Watling Street (here the main London–Birmingham road). These stretches are about half and a quarter mile long respectively, and I often wondered why they were there. Whether they date back as far as 1838, or not, I do not know, but such as they are they still exist."

A Flange Railway in North Cornwall.

IN the February, 1917, RAILWAY MAGAZINE reference was made to a flange railway connecting the beach with the canal side and with a siding from the station goods yard. Further particulars of this line are now available, and the following particulars for which we are indebted to officers of the London and South Western Railway, will no doubt be of interest to many readers:—

The flange railway at Bude is the narrow-gauge sand track belonging to the Stratton and Bude Urban District Council. A siding extends from the railway goods yard into the Council's land for dealing with the sand brought up by the narrow-gauge track. This is laid to a gauge of 4 ft., and comprises two classes of rail, an iron channel 4 in. wide and 3 in. deep, of an approximate weight of 60 lb. per yard in lengths of 9 ft. 10 in., the base of this channel at the ends and the centre of each length being a little wider to admit of an iron spike being passed through for the purpose of securing the channel to the timbers or granite blocks as the case may

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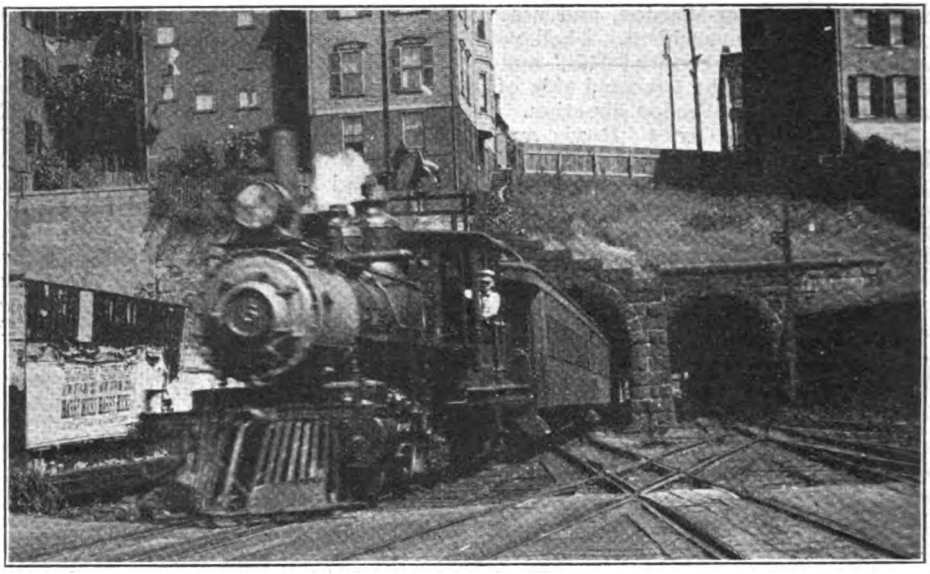

Photo.] No. 6 EMERGING FROM TUNNEL AT EAST BOSTON. [*C. E. Fisher.*

be. The other section of rail is comprised of an angle iron 4 in. wide and 3 in. deep, approximate weight about 50 lb. per yard, in lengths of 4 ft. 11 in., with a notch in the bottom flange part at the ends to enable the channel to be spiked to the longitudinal timbers or blocks. The total length of the track in question is about 350 yards, and in addition there is a short spur road about 33 yards long by the side of the canal, also a passing loop 70 yards long.

The rolling-stock used on the track consists of tip wagons 5 ft. in length over the buffers. The wheels are plain without flanges, and run in the channels. Horses are used for the haulage of these wagons. This narrow-gauge siding was constructed a great many years ago, long before the London and South Western Railway had constructed their line to Bude.

A Busy Narrow Gauge Railway in U.S.A.

MR. A. CURRAN sends several photographs, one of which is reproduced, of the Boston, Revere Bend and Lynn Railway, a 3 ft. gauge line running from Boston, about "the only narrow gauge railway in U.S.A. which really amounts to anything."

"The line extends from East Boston to Lynn, and handles a local passenger business of considerable proportions. The fare, anywhere on its lines, has been the equivalent of about 5*d.*, or 10 cents; but the matter is now being agitated and I cannot say what the result will be by the time you receive this letter. The line has a remarkable record for safety."

The locomotives are all tank engines of the 2-4-4 type, but built on the principles adapted by William Mason from the ideas of Fairlie; that is to say, with swivel drivers and flexible steam connections. A number of these engines were built for this line by the Mason Machine Works of Taunton, Mass. Others were built at Manchester, N.H., and at the company's works at Orient Heights. But all were like the Mason engines. From the first, these engines had the Walschaert valve gear; the latter being carried in a special manner due to the swivel arrangement of drivers. The first of these remarkable little engines was built in 1875, and the stock has been added to, as needed, ever since. The rolling-stock is fitted with vacuum brakes.

Engines, though of tank type, are turned after each trip. Trains run every 10 or 15 minutes, and consist of from 4 to 9 cars. The engines run very smartly, even with the heaviest loads.

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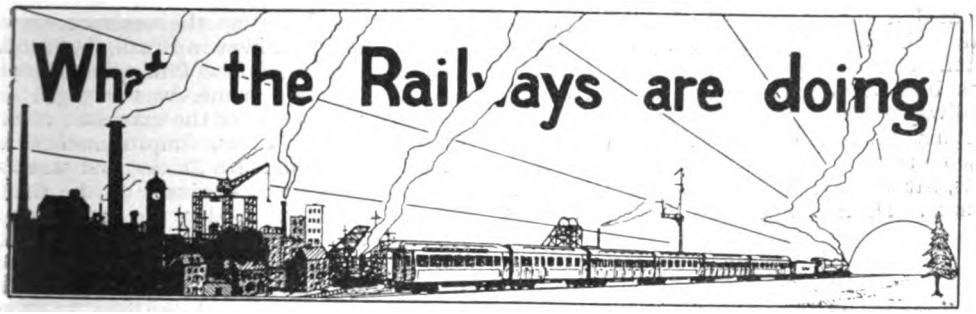

PARTICULARS of the appointments of Mr. Edward Lowther and Mr. Elias Ford to the positions of Chief Goods Manager and Deputy Chief Goods Manager, Great Western Railway, respectively, were given on page 59, RAILWAY MAGAZINE, July, 1921. Now we have pleasure in including portraits of the two officers in question, Mr. Lowther on this page and Mr. Ford on page 140.

* * *

WITH sincere regret we follow our reference last month to the retirement of Sir Gilbert Claughton from the chairmanship of the London & North Western Railway Company with an announcement of his death at the comparatively early age of 65 years. For a considerable period his health has been failing, largely as a result of the strain of the war period and the work he undertook in national interests, though much of it did not bring him prominently before public notice. He ranked among the most popular railway chairmen of to-day, both within the railway service and in the wider fields of trade and industry and national affairs. As already stated, his business career had been largely associated with the management of the Earl of Dudley's mineral estate, and in Dudley, where he generally lived, he was one of the most popular personalities in connection with local and county affairs. He was a director of various public companies, but it was as Chairman of the London and North Western Railway Company from 1911 to 1921 that he became best known. The funeral took place on July 1 at Dudley Parish Church. The London and North Western Railway Company was represented by the Hon. Charles Napier Lawrence (Chairman); Sir Edward Tootal Broadhurst, Bart., Mr. C. J. Cropper, Mr. W. E. Dorrington, Colonel Lord Kenyon, Sir Arthur Lawley, Mr. George Macpherson, and Sir Thomas Williams (directors); Sir Nicholas Waterhouse (Auditor), Mr. J. Bishop (Secretary), Mr. E. F. C. Trench (Chief Engineer), Mr. L. W. Horne (Superintendent of the Line), Mr. C. F. Graseman (Assistant to General Manager), and other officers.

Elliott] [*& Fry.*

MR. E. LOWTHER, J.P.,

Chief Goods Manager, Great Western Railway.

* * *

WE regret to announce the death of Lord Balfour of Burleigh after a brief illness. Lord Balfour of Burleigh was well known in the City and esteemed for his abilities and personal attributes. He was the Governor of the Bank of Scotland, and was Chairman of the Eastern Bank, the Imperial and Foreign Corporation and the San Paulo (Brazilian) Railway; a director of the Great Northern Railway, Peninsular and Oriental Steam Navigation and Western Telegraph Companies, and a member of the Council of the Russian and English Bank.

* * *

THE Right Hon. Sir Ailwyn E. Fellowes, P.C., K.C.V.O., K.B.E., Deputy-Chairman of the Great Eastern Railway, who was

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created a peer on the King's birthday, has taken the title of Baron Ailwyn of Honingham, in the county of Norfolk. Lord Ailwyn has been a director of the Great Eastern Railway Company since 1904 and became Deputy Chairman in 1910. From 1887 to 1906 the Hon. Ailwyn Fellowes, as he then was, sat as Member of Parliament for North Hunts. During that time he held various

MR. ELIAS FORD,

Deputy Chief Goods Manager, Great Western Railway.

offices in the Ministry, and in 1905 was appointed President of the Board of Agriculture with a seat in the Cabinet. The K.C.V.O. was conferred by the King on the field on the occasion of the Royal Agricultural Show at Norwich in 1911. During the war he rendered good service at the Board of Agriculture in connection with food production, and in 1917 received a K.B.E. Among other public services he was the first Chairman of the Agricultural Wages Board, and is Chairman of the Norfolk County Council.

* * *

MR. WILLIAM WILLOX, M.A., M.Inst.C.E., Chief Engineer of the Metropolitan Railway since 1906, has retired from that position and has been appointed Consulting Engineer. Born in Aberdeenshire, he was educated at Aberdeen Grammar School and University, gaining the degree of M.A. (Aberdeen), afterwards serving an apprenticeship with Bell & Miller, engineers, of Glasgow. He was later employed on the construction of the Conde d'Eu Railway in Brazil, the Manila Dagupan Railway in the Philippine Islands, and, on returning home, was engaged on Parliamentary work for the extension of the Aberdeen Waterworks, improvements at Bristol and Avonmouth Docks, and was for a time an Assistant Engineer on the Great Eastern Railway. Under the late Sir J. Firbank, as contractor's engineer, he was engaged on numerous important works, and then became Resident Engineer for the Stoat's Nest to Earlswood new lines, London, Brighton and South Coast Railway, also Northern District Engineer for the same company. He was appointed Chief Engineer to the Metropolitan Railway in 1906, in which capacity he has been responsible for most of the notable engineering improvements and developments which that company has carried out since the initial electrification, including the Finchley Road to Harrow widenings; entire reconstruction of Baker Street Station, the erection of flats over the lines, and the new general offices; and the installation of all-electric power and automatic signalling throughout the London area. He was President of the Permanent Way Institution for 1908, and an enthusiastic supporter of that Institution throughout his connection with it. He is a member of the Institution of Civil Engineers, by which he was awarded the Telford Premium.

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MR. EDWARD A. WILSON, O.B.E., Stratford Divisional Civil Engineer, Great Eastern Railway, has been appointed Chief Engineer of the Metropolitan Railway. Mr. Wilson entered the Great Eastern service in 1892 as

MR. E. A. WILSON, M.Inst.C.E.,

Chief Civil Engineer, Metropolitan Railway.

a pupil to his father, Mr. John Wilson, then Engineer-in-Chief, and after a varied experience in maintenance and construction was appointed Engineer in charge of New

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Works, afterwards becoming Assistant Engineer. In 1910 he succeeded Mr. Harry Jones as Divisional Engineer at Ipswich, and in 1914 volunteered for service with the Forces, and left for the Western Front with the Railway Construction Troops. During the years 1917 and 1918 he held the positions of Engineer in Charge of railway construction and maintenance on the lines of communication, Chief Railway Construction Engineer, and finally became Controller of Transportation Maintenance. During his military career he attained the rank of colonel and gained the Military Cross, and was made an Officer of the Order of the British Empire. Whilst with the Forces Mr. Wilson was appointed Divisional Civil Engineer at Stratford, which appointment he took up on his demobilisation. Mr. Wilson's portrait on page 140 is inserted by the courtesy of the *G. E. R. Magazine*. In addition to the appointment of Mr. Edward A. Wilson, as Chief Civil Engineer in succession to Mr. William Willox, Mr. C. W. Clark, A.R.I.B.A., has been appointed Architect to the Metropolitan Railway.

* * *

THE directors of the South Eastern and Chatham Railways Managing Committee have appointed Mr. J. S. Wilson Assistant Audit Accountant in succession to Mr. W. M. Elliott, retired. Mr. Wilson's services were placed at the disposal of the Government during the war in connection with the transportation of the British Army in France and Belgium, and he held the position of Railway Accountant to the British Army in France from May, 1915, to November, 1919, first with the rank of major and subsequently with that of lieutenant-colonel. Colonel Wilson was thrice mentioned in despatches, and was awarded the O.B.E. for his services in France and Belgium. After leaving France he served for a time at the War Office and received the thanks of that department for the assistance rendered by him in connection with the many important transportation questions which arose with the French and Belgian Governments.

* * *

MR. T. S. J. CÆSAR, one of the Travelling Auditors, succeeds Colonel Wilson as Chief Clerk in the audit accountant's office. Soon after the outbreak of hostilities Mr. Cæsar was transferred to headquarters, and rendered good service in connection with the many difficult questions which arose from time to time during the war. He is one of the investigators appointed by the Sub-Committee of Railway Accountants to examine the accounts of other controlled railway companies on behalf of the Government, and will continue so to act until the completion of their labours.

* * *

THE King visited the Royal Agricultural Show at Derby on Wednesday, June 29. The platform at Derby and the exit were tastefully decorated with light blue draperies and an abundance of flowers. Here His Majesty, who had left Newmarket at 8.5 a.m., was met by the Mayor of Derby, Alderman W. Laurie, with whom he shook hands very cordially and exchanged a few words of greeting. The Mayor then made a number of presentations, including Mr. Charles Booth, Chairman of the Midland Railway Company, and Mr. Frank Tatlow, C.B.E., General Manager.

* * *

AT a meeting of the Central Council of the Railway Stockholders' Protection Association held in London on July 1, there was presented to Mr. W. F. Russell, Chairman of the Council, by some of his colleagues in the Association as a small token of their recognition of his services to stockholders in English, Scottish and Irish railways, an antique silver inkstand of 1824. Sir Charles Wakefield, Chairman of the English Association, in making the presentation, referred to the services which Mr. Russell had rendered and the great amount of time and energy he had expended in building up the stockholders' organisation, which had been the means of securing to the stockholders valuable concession in the Railways Bill now before Parliament.

* * *

AN interesting ceremony—the third annual event of its kind—took place at the Midland Railway Company's Somers Town Goods Station on Monday, July 4, when Mr. H. F. Loney, O.B.E., M.Inst.T. (Chief Goods Manager), after warmly congratulating the successful competitors and drivers in the streets generally—particularly Midland Railway employees—presented London "Safety First" Council awards of bars (for attachment to the Council's 1917–18 and 1919 medals), medals and diplomas to motor drivers and carmen who had been free from blameworthy accident in accordance with the conditions laid down by the Council. The chair was taken by Mr. E. Falconer, M.Inst.T. (London Goods Operating Superintendent), who is a member of the Council. He was supported by Mr. J. Pepper, M.Inst.T. (Assistant Goods Manager), one of the pioneers in connection with the movement when District Goods Manager in London, Mr. E. H. Hackwood, M.Inst.T. (London Commercial Goods Manager), and Mr.

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Wheen, of the District Passenger Agents' Office, Mr. Turner of the Veterinary Department, and others.

* * *

ON Tuesday, July 5, the London and South Western Railway inaugurated the revived Southampton and Cherbourg service, which had to be suspended early in the war

WAGONS BREAKING AWAY ON HUMP SUMMIT. CHALK FIGURES DENOTE ROAD.

owing to the steamers being requisitioned by the Government. This route is the most convenient for Valognes, Carentan, Bayeux, Caen, Arromanches, Coutances, Avranches, St. Lo, Granville, &c. The service is tri-weekly—from Southampton on the nights of Tuesday, Thursday and Saturday, and from Cherbourg on the nights of Monday, Wednesday and Friday. The open sea passage occupies five hours and the railway connection from London is made by special boat express leaving Waterloo at 9.30 p.m. The steamer *Ardena*, which has been placed on this service, was a war-time cruiser, built in 1916 for the Government and bought by the railway company in 1920. The *Ardena* has accommodation for 510 passengers, first and second-class.

* * *

PARTICULARS of the London and South Western Railway concentration sidings and "hump" marshalling yard at Feltham were given in the RAILWAY MAGAZINE for February, 1920, and February, 1921. Further progress has since been made, and on May 1 last another important stage was reached when new down sidings, comprising reception and marshalling roads, were brought into use, and "hump" shunting introduced. As the equipment of the signal boxes which have been constructed is not yet complete, a series of ground frames has been installed. At present only six of the eight reception roads are provided. They vary in length from 1,056 to 1,211 feet, and have a wagon capacity of from 52 to 60, exclusive of engine. These reception roads are connected at the western end by means of trailing points with a single line of rail passing over the hump and leading to the marshalling sidings. The length of the hump line from the trailing point of these reception roads to the facing points of the marshalling sidings beyond the hump is 470 ft. The gradients of the hump line between these points are rising 1 in 60 to the hump, and falling 1 in 50 from the hump to the marshalling sidings. These will eventually number 20. At present 17 are in use, ranging from 1,435 to 1,639 feet, with a wagon capacity of from 71 to 82 each.

* * *

AT the annual general meeting of the London Railways Athletic Association, Sir Henry Thornton, K.B.E., General Manager, Great Eastern Railway, expressed the hope that during his second year of office he might be able to devote more time and thought to the affairs of the Association. In his opinion there were immense possibilities in the London Railways Athletic Association. As a mark of appreciation of his services over a long period of years to the Association, Mr. A. E. Bolter, Secretary, Great Western Railway, was the recipient of a gold-mounted umbrella, Sir Henry Thornton kindly making the presentation on behalf

GENERAL VIEW FROM HUMP SIGNAL BOX OF DOWN MARSHALLING SIDINGS.

of the subscribers. The following members of the Council were present:—Messrs. J. V. A. Kelly, E. E. Daws (Great Western Railway), G. Rudland, R. Fields, W. E. Pearson (Great Eastern Railway), D. H. F.

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Meacock, O. B. Hammond (London and North Western Railway), S. E. Edwards, J. H. Anderson (London, Brighton and South Coast Railway), H. Gray (Midland), T. E. Keele (South Eastern and Chatham Railway), W. T. Oman, C. E. O. Golding (Railway Clearing House), and F. W. Ward (London and South Western Railway).

* * *

IN the RAILWAY MAGAZINE for March, 1918, we described a device for safeguarding the accidental opening of railway carriage doors invented by Mr. W. K. Kaye, Chairman and Managing Director of the well-known firm of Joseph Kaye and Sons, whose safety locks are widely used. We understand that a train on the Great Northern Railway has been equipped with this system for trial purposes, and is now running.

* * *

TRAVELLERS will appreciate the new tea room at Waterloo Station, London, opposite the escalator, opened during the second week in July by the London and South Western Railway. The room is handsomely furnished and splendidly equipped, and one feature is an American Soda Fountain. The decorative scheme of the walls is in cream, with mirrors, giving an agreeable impression of coolness, brightness and spotless cleanliness. The floor is of polished oak parquet, and the counter fittings are of mahogany, while the illumination and ventilation schemes are perfect. The arrangement of the kitchen suggests that a speedy and efficient service will be provided.

* * *

THE Lancashire and Yorkshire Railway's "Holiday Manual" for 1921 is now available, and copies can be had on application to Mr. Ashton Davies, M.B.E., Superintendent of the Line, Manchester. Illustrated pages direct attention to the many places of holiday, tourist, scenic and historic interest accessible by Lancashire and Yorkshire Railway, while sections dealing with the Belgian battlefields—Blankenberghe, Bruges, Brussels, Ghent, Ypres and Zeebrugge—will be appreciated by those who contemplate visiting the Continent via the revised Hull and Zeebrugge service, again operated by the well-known steamer *Duke of Clarence*. Lists of furnished apartments, hotels, boarding houses, &c., form a most important and useful section of the manual, its scope extending to east and south coast, North Wales and Irish resorts, as well as to the Lancashire and Yorkshire system proper. A.B.C. lists of leading tradesmen, particulars of cafés and restaurants, and a steamship section, will also be of value to readers, while the illustrated and descriptive letterpress should assist any who have not yet decided where to spend a holiday to make a satisfactory choice.

* * *

FOR the health and pleasure seeker the London and North Western Railway is providing an admirable selection of travel literature. "The English Lakes," an attractive and well-illustrated book, in addition to a useful folded map of the lake district, includes a very informing article, "The Naturalist's Paradise," written expressly for this guide by Rufus H. Mallinson, F.E.S., F.R.H.S., of Windermere. "Central Wales by London and North Western Railway," illustrates and describes the land of Llandrindod, Builth, Llangammarch and Llanwrtyd, the four Welsh Spas. "Holidays in North Wales," by James N. Frith, contains a fine map printed in colours, showing railway lines, roads and motor 'bus routes. Both in letterpress and in illustrations the author does full justice to his subject,

"A land of sunlit seas,
Mountains on mountains piled,
And winding bays and promontories huge,
Lakes and meandering rivers."

* * *

IN "The Charm of England," by Basil M. Bazley, the London and North Western Railway has made an excellent addition to the travel literature of the day. The author, by original thought and engaging reflection, makes his reader feel that he is *tête-à-tête* with an attractive cultured personality conversing on a subject peculiarly his own. Intended for distribution mainly in the United States, the book has been issued in folder form in order that it may match in size and shape the popular prints found in the racks at American tourist agencies.

* * *

UNDER the title of "The Tourist's Mecca," the Stratford-upon-Avon and Midland Junction Railway has re-issued its well-known guide. Its principal subject matter relates, of course, to Stratford-on-Avon and its many Shakespearean associations; but the many other scenic and historic associations of the places served by this line also receive attention, while the lists of apartments, hotels, &c., available, will be appreciated by prospective visitors to this part of England, of never-failing interest to lovers of the Homeland as well as to visitors from the United States, to whom Stratford-on-Avon and Sulgrave Manor mean so much. Well illustrated, with a street plan and, as a folding plate, an aerial view of Stratford-on-Avon, together with interesting letterpress, readers will be well-advised to apply to Mr. A. E. Diggins, General Manager, Stratford-on-Avon, for a copy of this booklet.

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DURING the present summer passengers from all over Great Britain have every opportunity of getting to the Lake District, served by the Furness Railway, with practically pre-war comfort. The circular tours through Lakeland have been reinstated, and cheap tickets are now issued to and from all the pleasure resorts on the line. Cheap weekly tickets have been arranged on Windermere and Coniston Lakes, and the Furness Railway illustrated booklets will be sent to RAILWAY MAGAZINE readers on application to Mr. A. A. Haynes, Superintendent of the Line, Furness Railway, Barrow.

* * *

A GREATLY augmented passenger train service especially on the main line routes has been introduced by the North British Railway. Between London and Edinburgh and the North by the East Coast and Midland and Waverley routes, the service has been brought up to almost pre-war standard including through carriages and sleeping cars. The Lothian Coast Express between Glasgow and North Berwick and Gullane, the Fifeshire Coast Express between Glasgow and Dundee via Crail and St. Andrews; also the Fifeshire Coast Express between Edinburgh and Crail and the Peeblesshire Express between Edinburgh and Galashiels via Peebles have been restored. These summer express trains were in previous years greatly appreciated as affording a convenient morning and evening service between the Edinburgh and Glasgow and popular seaside and inland holiday and golfing resorts. Consequent on the increased facilities and especially the re-introduction of a number of favourite tourist bookings and cheap excursion fares, it is anticipated that a very heavy passenger traffic will be dealt with until the end of September.

* * *

IN further reference to the query raised on page 411 of the June RAILWAY MAGAZINE, and the paragraph on page 64 of the July issue the Rev. W. J. Scott, B.A., writes :—

"I owe my best thanks to you and your correspondents for information kindly given as to North London services west (or south) of Kew. Unluckily the question of Hounslow trains (North London) is left just where it was: that there is a strong tradition in favour of such a service sometime between 1853 and 1858 there can be no doubt, but a tradition it remains; and I begin to fear that the idea may be as baseless as the 'Brighton in one hour' (of course from London Bridge), which was almost as widely believed, but, as all students of time-tables know, has no basis in fact.

"As to the (supposed) Brentford service over the North and South-Western Junction line, this was to have been a joint one of the London and South Western and the London and North Western Railways; one difficulty about it was that no station then existed on the London and North Western main line where Willesden Junction (opened 1866) stood many years later. That such a service was agreed upon there is abundant evidence; that it ever ran, there is none at all. But Mr. Sekon thought that it did run for a few days; knowing his meticulous accuracy I was inclined to think he was right. If he still thinks so I shall guess that he may some day be proved to be right in this opinion."

* * *

A CENTRAL Union railway station is to be built in Peking. The project, which is under the direction of the engineer-in-chief of the Peking-Hankow Railway, will be built on a site east of the Temple of Heaven. At present there are two main line terminals in Peking, the Peking-Mukden and Peking-Tientsin-Pukow stations on the east of Ch'ien Men, and the Peking-Hankow and Peking-Suiyuan station on the western side. When this station is built there will be through connection between Hankow and all Chinese railway stations in the north.

* * *

A FAVOURABLE report has been made by the Public Works Commission of Queensland upon a proposal to link up Port Douglas with the terminus of the Mount Molloy Railway by means of a line of 20 miles. This would provide a second outlet to the coast from the rich agricultural and mineral areas of the Atherton Tableland, stimulating the dairying industry and making the path of commerce easier when the demand for the various minerals of the region becomes strong again, as it must do in the near future. The proposed connection would find a market for millions of tons of limestone at Chillagoe, to be utilised in the cultivation of cane sugar. It is considered by the Commissionesr that the linking line would be an insurance against any breakdown on the line to Cairns, saving the necessity for the costly duplication over the present line over the range of hills. They think, moreover, that the line should eventually be extended to the fine country north of Port Douglas and Mossman, embracing the Daintree River, Halley's Creek, and Bloomfield, and thence to Cooktown. Such a line would tap some of the finest agricultural and dairying country in Queensland.

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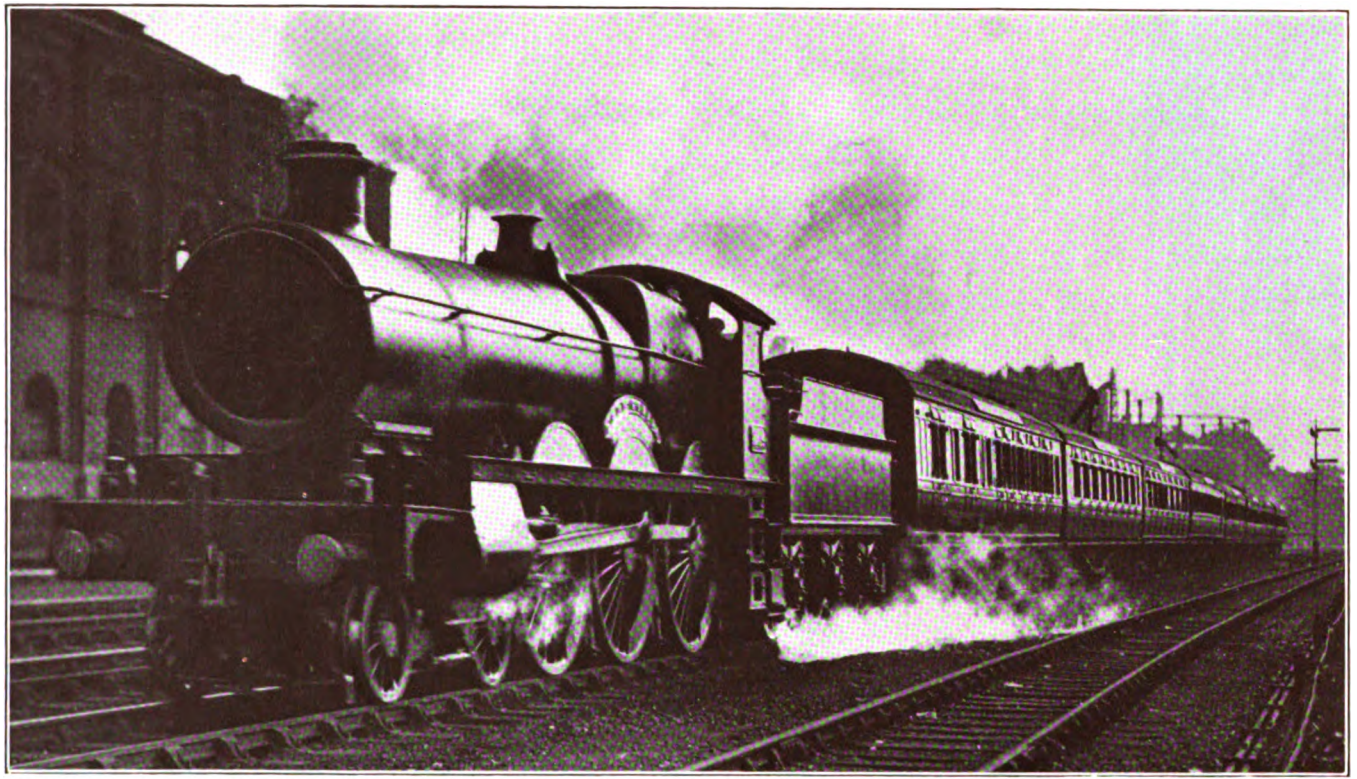

THE RAILWAY MAGAZINE. [*Photograph by F. E. Mackay.*

GREAT WESTERN RAILWAY WEYMOUTH EXPRESS.

4-6-0 locomotive No. 2904, "Lady Godiva."

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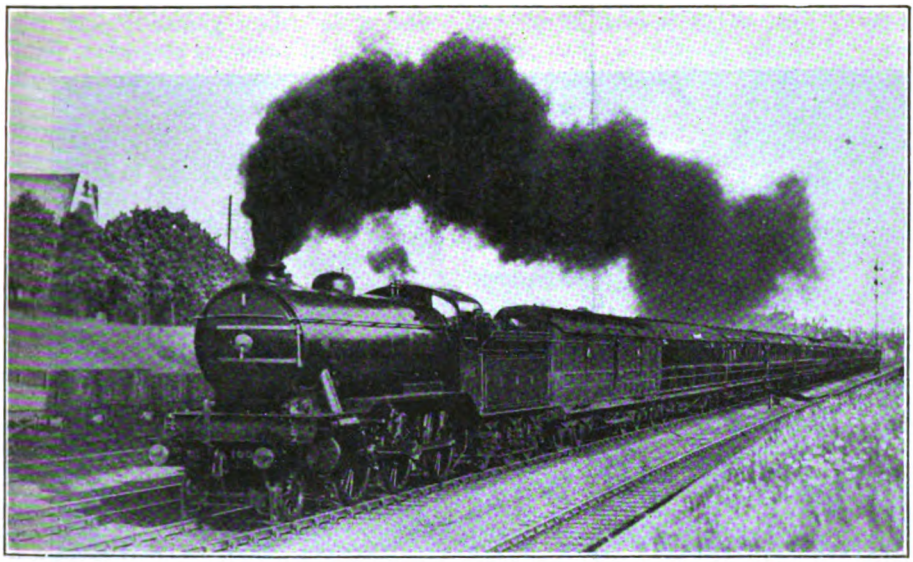

Photo.] GREAT NORTHERN RAILWAY. [*F. E. Mackay.*

5.30 p.m. Down Leeds, Bradford and Newcastle Express. 2-6-0 three-cylinder locomotive, No. 1003.

Heavy Locomotive Work on the Great Northern Railway.

By CHAS. S. LAKE, A.M.I.Mech.E.

OUR frontispiece last month showed one of Mr. H. N. Gresley's three-cylinder 2-6-0 locomotives on an 18-coach main line train ; and in view of the exceptional work which these engines have been doing, further reference doubtless will be appreciated by RAILWAY MAGAZINE readers.

The engines are classified as express goods locomotives, and as such they were primarily intended. Their work, however, has shown them capable of handling several different kinds of trains with equal readiness and efficiency, so that it is by no means uncommon to find one of the series hauling express trains of heavy loading and fast timing one day and goods trains of from 800 to 1,000 tons, exclusive of engine and tender, the next. Similarly, they work, as part of their regular routine, perishable trains running on through fast schedules, stopping goods trains, and, indeed, as observation shows, they seem to take a hand in almost every branch of service at one time or another, thus ranking, on the performance basis, as a mixed traffic class, which is, perhaps, the most accurate description that can fairly be ascribed to them.

It might be thought that a locomotive fitted with six-coupled wheels of such relatively small diameter as 5 ft. 8 in. could not reasonably be expected to handle fast passenger trains wherewith speeds of 60, 65, 70 and even 76 m.p.h. must be reached and maintained for appreciable distances if the schedule timings are to be punctually observed. The No. 1000 class locomotives have demonstrated their ability to perform this work with facility, as our own and other independent observations have proved. This, of course, is only one of several good qualities which an engine set to deal with heavy express passenger trains, run in accordance with a schedule that can only be regarded as a somewhat difficult one, must possess, if it is to show to advantage in the work given it to perform. There must be good accelerative

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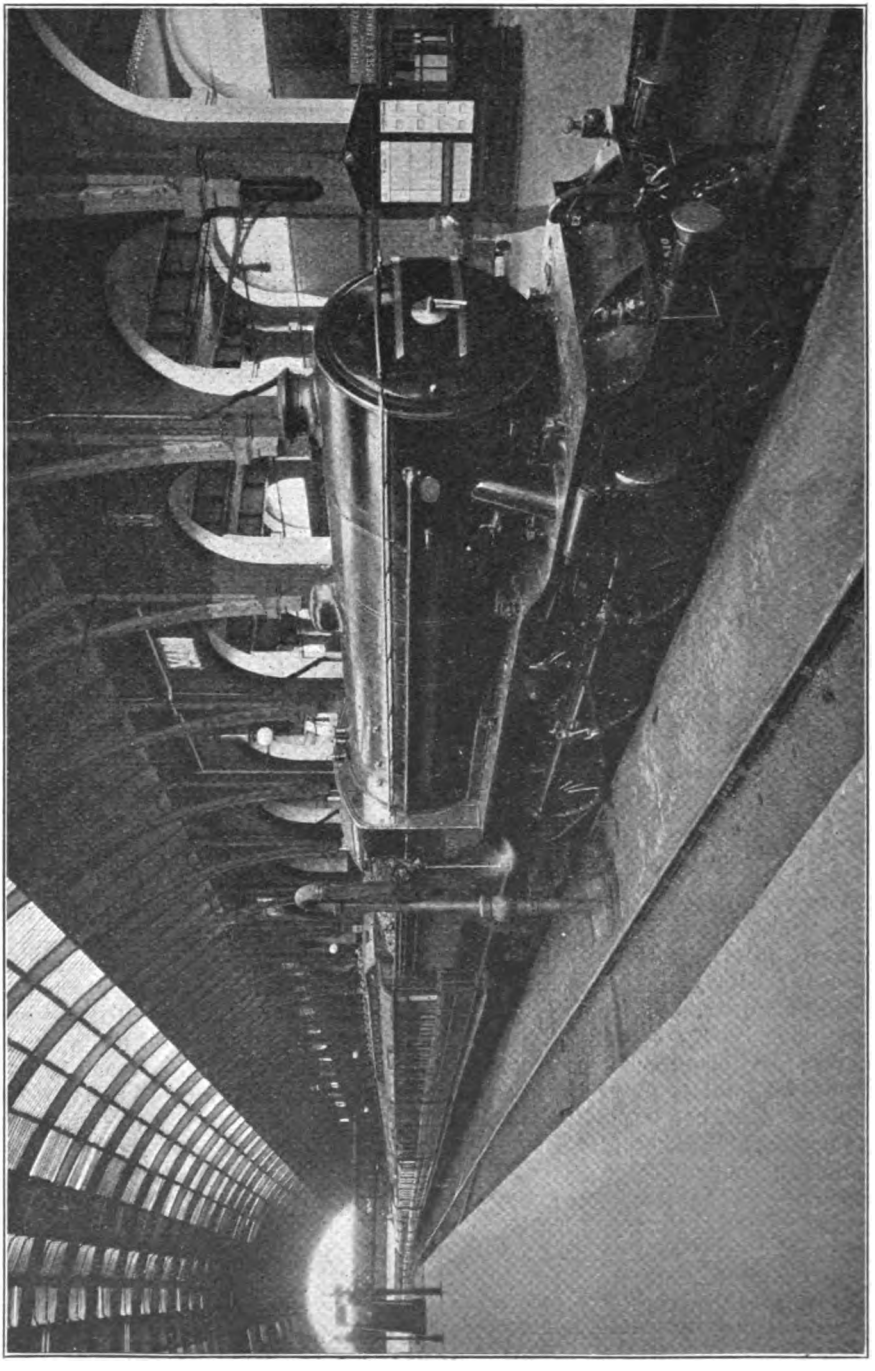

No. 1,007 ON 12-COACH TRAIN ON ARRIVAL AT KING'S CROSS.

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qualities, free steaming under all conditions, and reasonable economy in coal consumption. A locomotive with three high-pressure cylinders and cranks at 120 deg. operating six-coupled driving wheels of moderate diameter would naturally be expected to show up well in accelerating heavy train loads, but the ability to maintain speed without racking the moving parts of the engine or throwing too great a demand upon the boiler for steam, must also be present, and so in designing a locomotive with these points in view thought is required in order that conflicting factors may be reconciled. Practice in other countries, and particularly in America, has shown that (1) very high speeds can be attained with coupled wheels of relatively small diameter, and (2) that it is by no means compulsory to employ a four-wheeled truck at the leading end to ensure safe and ready curving at the highest speeds. These points have been confirmed by the behaviour of the "No. 1000" class engines of the Great Northern Railway.

During the coal crisis certain of the principal train workings on the Great Northern Railway were re-arranged with a view to economising in coal consumption and engine power, these measures being supplementary in a sense to the general cutting down of train services due to the same cause on this and other railways. The result was the creation of some exceptionally long and heavy express passenger trains made up of two or more others which ordinarily would be worked as separate units, and involve the use of extra locomotive power. As an example of this there is, or rather was, the case of the 10.58 a.m. train from Doncaster to King's Cross. This was a combination of the express from Hull and Leeds due to arrive in London at 1.55 p.m., and that from Newcastle and York due King's Cross at 2.20 p.m. As the fast train from Peterborough and the Eastern Counties, timed to reach London at 1.20 p.m., was cancelled, it may be said that the work of this train was also performed by the combined train as between Peterborough and London, so that by the time the train started on its non-stop run between these last-named points, it virtually represented a combination of three trains in one, with a necessarily very heavy loading behind the engine.

The train as a rule consisted of from 18 to 20 vehicles, two of which were 12-wheeled dining cars, a total of 76 to 84 pairs of wheels, and a weight of train ranging, with passengers and luggage, from about 590 to as much as 650 tons, exclusive of engine and tender. On a selected occasion the writer was enabled by Mr. Gresley's courtesy to travel upon the footplate of engines engaged in working this particular train. The experience proved extremely interesting and gave at first hand a true impression of what the No. 1000 class locomotives are capable of doing single handed with what rank as, perhaps, the heaviest express passenger trains ever handled in this country on a regular daily schedule.

On the day chosen for the trip the train was made up of 18 vehicles, including two 12-wheeled dining cars, the exact weight of the carriages being 545·5 tons. There were 849 passengers in the train, with, in addition, a heavy volume of luggage, so that a reasonable computation of the total weight to be hauled by the one locomotive would be somewhere in the neighbourhood of 605 tons as a minimum. The train, after leaving Doncaster with the combined sections, *i.e.*, one from Hull and Leeds and the other from York, called at Retford, Grantham and Peterborough on its way to London, with an additional stop on Wednesday—the day on which the trip was made—at Newark. Leaving Doncaster at 10.59 a.m., *i.e.*, one minute late, Retford was reached at 11.19 a.m. (due at 11.20 a.m.), the engine thus saving two minutes, the distance, 17½ miles, being covered in the inclusive time of 20 minutes from start to stop, or at the rate of 52·5 m.p.h. According to the schedule only one minute was allowed for the call at Retford, but owing to the extreme length of the train, which, with the engine and 18 coaches described, measured 1,126 ft. 3 in. overall, it was necessary to draw up at this and each of the intermediate stations, thus making it obviously impossible to perform all the platform work involved in the time allowance mentioned. However, a very creditable showing was made by the platform staff, both here and at the other stations called at, with the result that less time was lost in the aggregate than might reasonably have been anticipated in the case of a train having to draw up at each of four main line junctions where in all cases a heavy volume of traffic has to be

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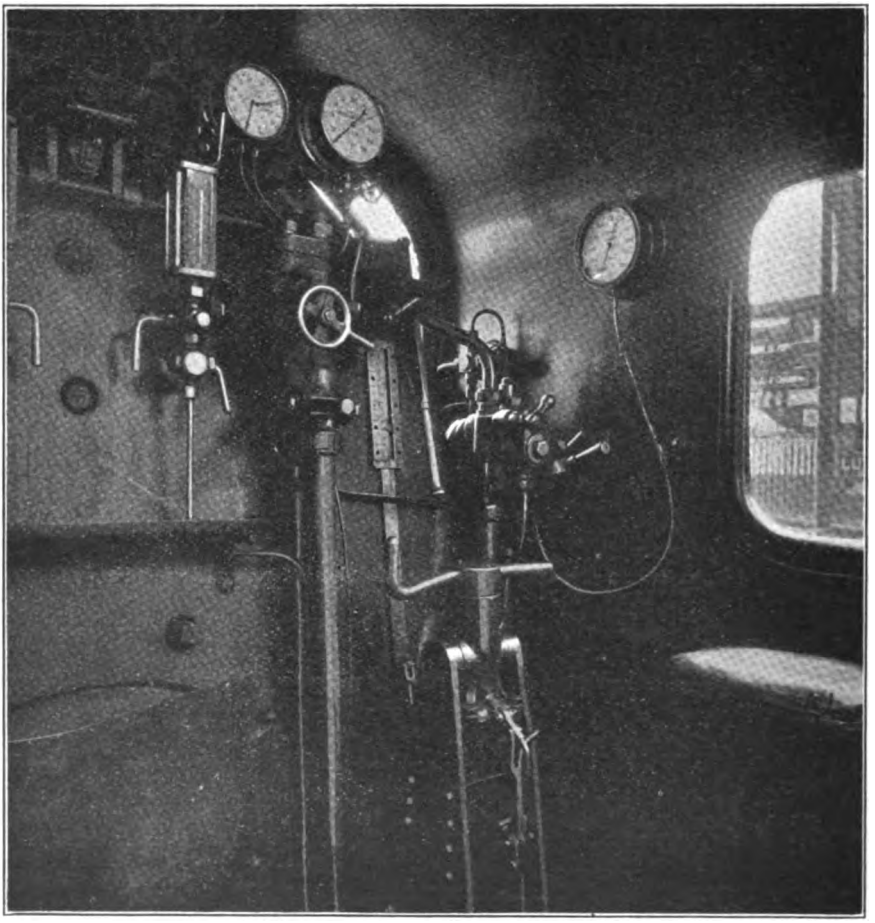
dealt with. On both occasions, viz., on leaving Doncaster and again on leaving Retford, the engine demonstrated excellent starting and acceleration qualities, which were particularly noticeable at Retford, where a bank graded at 1 in 178 followed by 1 in 200 has to be faced, this extending for a distance of about 4 miles, viz., to Askham tunnel.

sides and back of the firebox. This is accounted for by the fact that the rate of combustion for the whole of the grate is very uniform, and owing to the grate sloping it is necessary to fire much more at the back than at the front. The safety valves, of the "Ross" pattern, are set to blow off at 180 lb. pressure, but on this engine, No. 1006, they lifted at about 178



CAB OF ENGINE No. 1007, SHOWING GAUGES AND OTHER DETAILS.

The driver, who handled the engine with skill, started away with the valves cutting off at about 63 per cent. of the stroke, but shortly afterwards linked up to 40 per cent., and for the most part ran with the cut-off ranging from 30 to 32 per cent.

It was noticed that frequent but moderate firing was the rule, coal being for the most part placed under the door and at the

lb.; the lowest point reached anywhere on the trip being 165 lb. The cab fittings include a steamchest pressure gauge, and also a "Cambridge" pyrometer or index thermometer, thus making it possible on the one hand to note the drop in pressure that takes place as between the boiler and the steamchests, and on the other the temperature degree reached in superheating

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the steam. Taking average conditions it seemed that the pressure at the steam-chest, running with the regulator fairly well open, was about 20 lb. less than that shown on the boiler gauge, the steamchest pressure rising as the cut-off of the valves was shortened. The superheat, as indicated by the pyrometer, ranged from 650 to 700 deg., falling as a matter of course after standing and rising during continuous runs.

On the way from Retford to Newark very smart running was made on the down grade past Tuxford and Carlton to Newark, where the train, due at 11.45 a.m., was actually brought to rest at 11.48 a.m., three minutes behind schedule, one minute less than the amount overstayed at Retford, and due entirely to the necessary drawing up of the train. Leaving Newark at 11.51 a.m., and having before it an almost continuous up grade past Claypole and Hougham to Grantham, the arrival at the latter place was at 12.12 p.m. The section of the line between Newark and Grantham not only entails some heavy climbing, but also incorporates several curves, which, with a train of 76 wheels or more, means, quite obviously, added resistance to the pull of the engine. The "collar" work done by No. 1006 on this length showed the engine to great advantage, the steam pressure being maintained without difficulty, the needle fluctuating between 160 and 170 lb. the whole of the time.

After Grantham, which was left at 12.18 p.m., there is first a heavy piece of climbing 5 miles in length, at 1 in 200 and 1 in 178, to Stoke summit—reputed to be the highest point on the Great Northern main line between London and York—followed by several miles of down grade, so that the engine has here in a few miles the opportunity of showing what it can do in both respects, viz., heavy pulling against the grade, and immediately afterwards reaching high velocities on the declivity that follows, Careful note was taken of what happened under the respective circumstances. The 5 miles climb from Grantham to Stoke occupied a trifle over 10 minutes, or at the rate of between 29 and 30 m.p.h. The time consumed included the task of overcoming the inertia of the 600-ton train at the foot of the 1 in 200 grade, and passing over the summit, 5 miles further on, the last portion of the climb being in tunnel (880 yards). The speed of the train on entering the tunnel had reached close upon 40 m.p.h. Then began a most remarkable exhibition of high speed running downhill, passing Corby, Little Bytham, Essendine Junction and Tallington, and so on over the Werrington water troughs to Peterborough, practically the whole distance after passing Stoke summit, which is exactly 100 miles from London,to Peterborough being on the down grade or level. Much of the grading on this section is fairly steep, viz., 4 miles of 1 in 178, followed almost immediately by nearly 5 miles of 1 in 200. On these sections we noted, by stop-watch, speeds of 74, 75 and 76 m.p.h. at which times the engine ran remarkably steadily considering the high velocity and the fact that the coupled wheels were revolving at so great speed.

The train reached Peterborough at 12.51 p.m., or six minutes late, leaving again, after an eight minutes stay, at 12.59. The station work had been very heavy throughout the trip, and was particularly so at Peterborough, whilst, being a Wednesday, the additional call at Newark considerably affected the time keeping. The distance from Doncaster to Peterborough, roughly 80 miles, had thus been covered in a gross running time of 1 hour 52 min., the three intervening stops accounting for 14½ min., giving a net running time of 1 hour 37·5 min., or an average speed of 49 m.p.h.

At Peterborough the engine was changed for another of the same class for the non-stop run to London. This proved to be No. 1007, the latest built of the series. The line from Peterborough undulates for a few miles and then, shortly after passing Holme Junction, rises at 1 in 200 for 4¼ miles to Abbots Ripton. No. 1007 gained speed quickly, and got the 600-ton train running at a high velocity on the level stretch before tackling the up grade to Abbots Ripton, which latter was negotiated in excellent style, the train hereafter running very fast on the 1 in 200 down grade to Huntingdon, the station at that point being passed at 1.22 p.m., the speed from Peterborough thus averaging 52 m.p.h. From this time onwards excellent progress was made, particularly on the long and for the most part rising section through Hitchin to Stevenage. Hitchin Station was passed at 1.52 p.m., Hatfield 2.8 p.m. and Potter's Bar 2.14 p.m., the average

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speed from Hitchin thus being 52·5 m.p.h. with a maximum of 65 m.p.h. passing Hatfield. Shortly afterwards, on emerging from the most southern of the Hadley Wood tunnels, the train was checked by "caution" signal, and turned on to the up slow road, whereon it continued running at greatly reduced speed through New Barnet and Oakleigh Park to New Southgate, this deviation being due to work on the repainting of bridges. The train came to rest at No. 1 arrival platform at King's Cross at 2.34 p.m., or 11 minutes late, the non-stop run from Peterborough, 76¼ miles, with the lengthy slack from Hadley Wood to New Southgate, having thus occupied 1 hour 35 min., an average speed of 48 m.p.h., which performance the same engine with an even heavier train has since improved upon. It may be mentioned that, on the testimony of Mr. Gresley himself, on Tuesday, June 14, when the train consisted of 20 bogie vehicles, time was made up by the engines both between Doncaster and Peterborough, and the latter place and London, the time occupied on this last section being 91 min. from start to stop (93 min. being allowed), which brings the speed to just over 50 miles an hour.

Other investigations have shown that taking the average of 16 trips the coal burned by the No. 1000 class engines with these very heavy passenger trains amounts to 104 lb. per 1,000 ton-miles, and to 51·1 lb. per train-mile, which must be regarded as a very excellent showing when the weight of the trains and conditions generally are taken into account. The coal burned on the occasion of the writer's trip was of good medium quality, although some of it appeared to be of a somewhat slaty description. Whatever may be said in that direction it is certain that in both cases the engines steamed freely, and the firemen's task—although the shovel was freely plied on occasions—did not seem in any degree more arduous than is usual.

The work performed is of an unquestionably meritorious description, a mean speed of 48 m.p.h. (excluding stops) being achieved with over 600 tons behind the tender over the complete distance.

The writer would express his indebtedness in the first place to Mr. Gresley for the facilities afforded, and also to Mr. C. J. Selway, Superintendent of the Line, for information respecting traffic workings.

CONVERTED 2-6-2 TANK ENGINE, GREAT WESTERN RAILWAY.

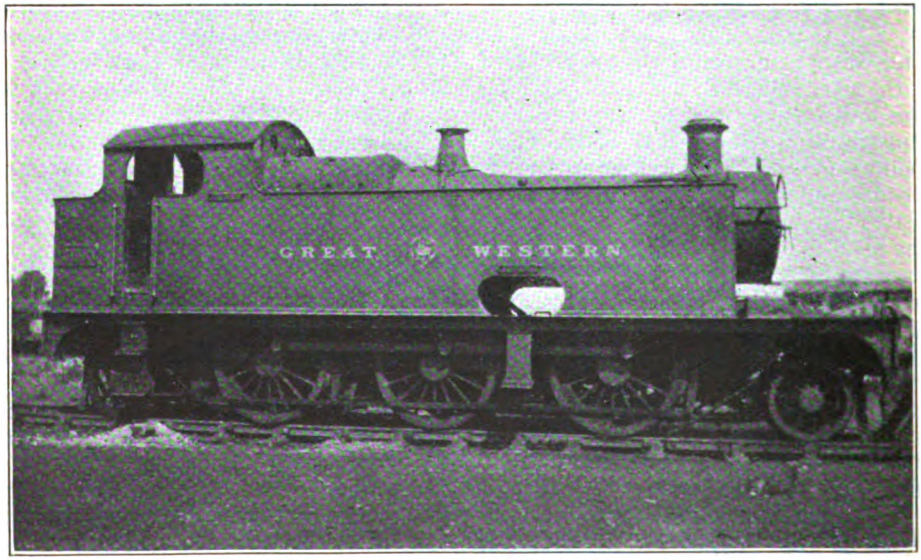

Photo.] [*N. T. Carrington.*

This engine is one of 20, chiefly employed in the Birmingham district, converted from 0-6-0 tender locomotives.

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COMBE ROW STATION, FIFTY YEARS AGO.
Looking north and showing one of the original engines.

The West Somerset Mineral Railway.

By H. L. HOPWOOD.

INSTANCES of complete railway systems worked for some years and then entirely abandoned, are comparatively rare in this country. The tragic story of one—the Potteries, Shrewsbury and North Wales Railway—has already been told in these pages,* and there is the case of the Edenham Branch Railway, constructed and worked by private enterprise and finally abandoned nearly fifty years ago. In Somersetshire, there is another derelict line, formerly extending from the seaport town of Watchet to the Brendon Hills. This was the West Somerset Mineral Railway, the chequered career of which is now related.

The discovery, in the middle of last century, of iron ore in the Brendon Hills, was responsible for the inception of this railway. The news that ore existed in considerable quantities brought an influx of workers to the district, and very soon a small mining town was formed. A railway to convey the product to Watchet being the next consideration, the "West Somerset Mineral Railway" was projected, and duly authorised by Act of July 16, 1855.

As constructed, the main line was 11 miles long and virtually in two sections. Commencing at Watchet Harbour, the first section extended for seven miles to Combe Row, at the foot of Brendon Hills. From this point it was boldly continued up the hill by means of an inclined plane, 49 chains in length and on a grade of 1 in 4. At the top, the line turned west and ran for 3½ miles along the ridge to a terminus at Gupworthy. At a short distance from Brendon Hill the high-level line attained an altitude of no less than 1,344 ft. above sea level. On this section a number of short branches were made to connect with the mine workings.

A serious accident occurred on Saturday, August 22, 1857, whilst the line was in course of construction. Mr. James, the engineer-in-charge, desired urgently to

* See RAILWAY MAGAZINE, May, June, 1903.

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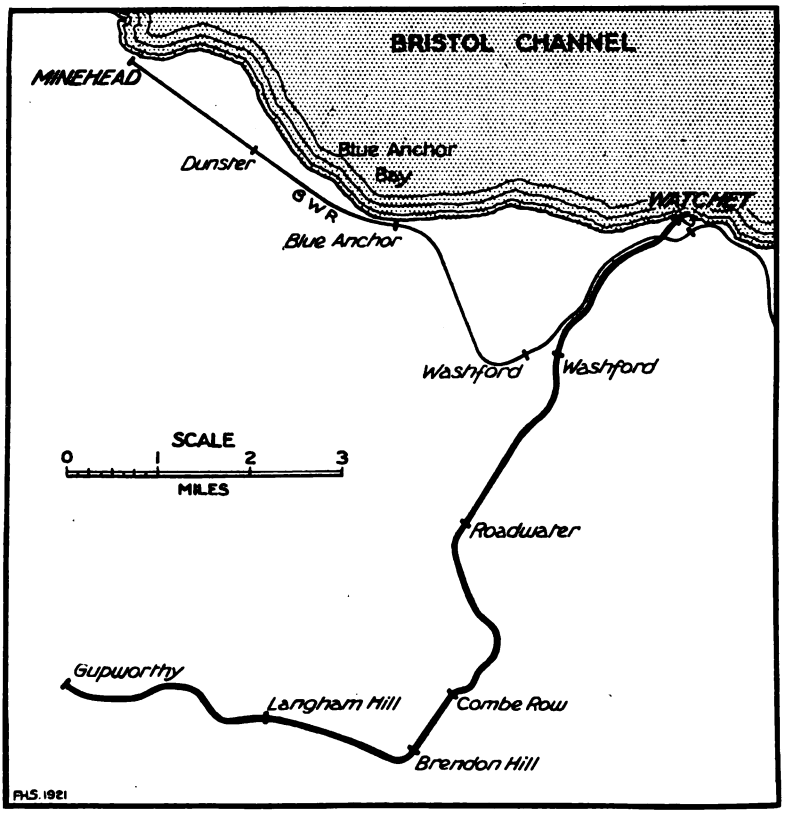
reach Watchet, in order to post some important letters, and, accompanied by several workmen, he went down from Roadwater with an engine and wagon, but was stopped at Washford, and told to wait the arrival of an engine, then about to leave Watchet for Washford. Heedless of the warning, Mr. James gave authority to proceed, and when near to Watchet, the two engines met on the single line and collided with considerable force. Mr. James and three workmen were killed, whilst a number of others were seriously injured. The collision was the means of drawing attention to the then lax method of working single line railways in some parts of the country. No system of staff working seems to have been in operation, but it is only fair to the railway company to say that the accident happened before the line was ready for traffic, and while it was yet in the hands of the contractor.

The line was opened for mineral traffic on September 28, 1859, and for 2½ years it was the only railway at Watchet, the West Somerset (now Great Western) line from Norton Fitzwarren not being opened to Watchet until March 31, 1862, nor the extension thence to Minehead until July 16, 1874. Between Watchet and Washford, the Minehead and West Somerset Mineral Railways ran side by side, but there was no physical connection between them, nor, indeed, was any possible, as the former was originally of broad gauge.



MAP OF THE WEST SOMERSET MINERAL RAILWAY.

From the commencement, the Mineral Railway was worked under agreement by the Brendon Hills Iron Ore Company, and for four years there occurred no incident that requires specially to be recorded. In the year 1864, however, a new traffic agreement was entered into with the Ebbw Vale Steel, Iron and Coal Company, who, by this time, had acquired

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an interest in the mines—in fact, a great deal of the iron ore shipped at Watchet Harbour was destined for the Ebbw Vale Company's works in Monmouthshire. The agreement, already alluded to, was of far-reaching importance, as subsequent events will show. It provided that the Ebbw Vale Company should work the line for a period of 55¼ years from June 24, 1864, and pay a minimum guaranteed sum of £5,575 per annum to the West Somerset Mineral Company, besides being liable for the cost of maintenance and working. This agreement was confirmed by Act of Parliament, dated June 24, 1869.

A passenger service was inaugurated on September 4, 1865, when four trains commenced to run each way daily between Watchet and Combe Row. There were intermediate stations at Washford and Roadwater. Station buildings were also erected on the high-level section at Brendon Hill, Langham Hill and Gupworthy, but the two latter were never brought into use, as the Board of Trade refused to sanction the running of passenger trains up and down the incline. It was the practice, however, for passengers to be taken up the incline to Brendon Hill at their own risk.

Two engines were at work at the opening of the line. These were 0-6-0 saddle tanks with double frames, the cylinders being 16 in. by 24 in., and the wheels 4 ft. 6 in. diam. Built by Sharp, Stewart & Co., (Nos. 995 and 996) in 1857, it is probable that they were used during construction of the line. In 1866, the same makers delivered to the Ebbw Vale Company two further engines, of their then standard pattern of 0-6-0 saddle tank, with all wheels placed in front of the firebox. The wheelbase was 12 ft. 8 in., whilst the cylinders (inside) were 17 in. by 24 in. and the six coupled wheels 4 ft. 6 in. in diameter. A total heating surface of 1,184·5 sq. ft. was provided, the boiler pressure was 120 lb. and total weight 36 tons.

During the 1880's the importation of a cheaper ore from Spain began to affect the Brendon industry—indeed, so seriously as to cause the workings very shortly to close down altogether. The plant was sold, the mining population left the neighbourhood and the township became derelict, soon to fall into ruin. The result was most unfortunate for the Ebbw Vale Company, as under the agreement of 1864, they were obliged to continue to pay the railway company the minimum guaranteed sum of £5,575 each year until 1919. The principal traffic—iron ore—had ceased, and there remained nothing but passengers and goods to cater for. Both of these items were very much reduced in quantity, for most of the population had migrated elsewhere. Apart from the sparse local traffic, there were a few excursionists in the summer months who used the railway in order to reach Brendon Hills, but they were not in sufficient numbers to pay working expenses.

The Ebbw Vale Company removed most of the rolling-stock, leaving only the engine *Pontypool*, two passenger carriages, and a few wagons to work the traffic. In 1892 there were two trains a day each way, and a time sheet of the period, seen at Combe Row station many years after the date to which it referred, is reproduced.

WEST SOMERSET MINERAL RAILWAY.

WATCHET TO THE BRENDON HILLS.

Alteration of Trains.

On and after June 1, 1892, the following trains will run :—

Up trains—	1, 2, 3. a.m.	1, 2, 3. p.m.
Watchet	9.15	3.10
Washford ..	9.25	3.20
Roadwater	9.35	3.30
Combe Row ..	9.45	3.40
DownT rains—	a.m.	p.m.
Combe Row ..	10.45	4.15
Roadwater ..	10.55	4.25
Washford ..	11.5	4.35
Watchet ..	11.15	4.45

Both " Bradshaw " and official railway maps showed the distance from Watchet passenger station to Combe Row as six miles—actually, it was nearer 6¾ miles—and it will be observed from the above time-table that 30 minutes were allowed for the journey; not a very rapid rate of progress.

In January, 1898, the service was reduced to one trip each way between Watchet and Combe Row, only the morning train running out and home, and in the following March the Ebbw Vale Company applied to be relieved of their liability to keep the railway open. To

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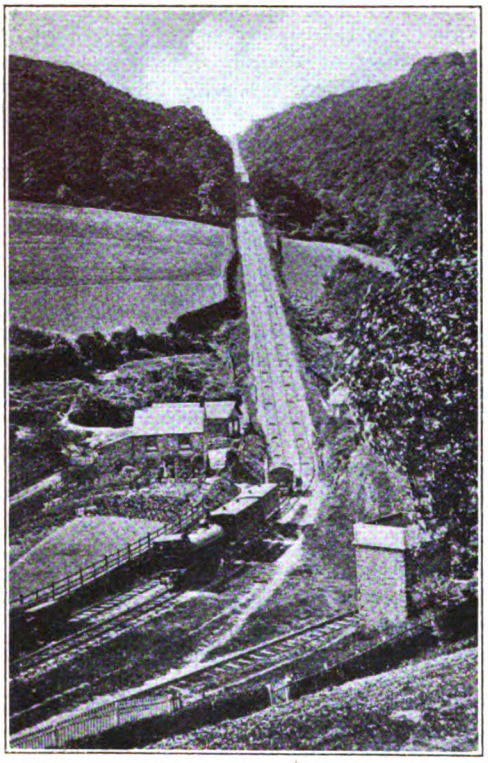

COMBE ROW INCLINE, THIRTY YEARS AGO.
Showing passenger train and engine "Pontypool."

this request, the West Somerset Mineral Company agreed, subject to the guaranteed sum being paid as heretofore. On November 7, 1898, the line was therefore entirely closed, and the remaining engine, *Pontypool*, shipped across the Channel to the Ebbw Vale Company's works. Not so, the passenger coaches, which were probably not worth removing. They remained at Watchet station, and a photograph in the writer's possession shows them in the last stage of decrepitude, with windows and doors broken and the bodies rapidly falling to pieces.

For nearly ten years the railway remained disused, but was kept in order by men who patrolled the track. In 1907 it seemed as though another era of prosperity was about to set in, for a new Company—the Somerset Mineral Syndicate—was formed for the purpose of re-opening the mines. They leased the section of railway from Watchet to Brendon Hill, and brought it into use again on July 4, 1907, but the syndicate's efforts to work the mines on a paying basis apparently proved unsuccessful, for two years later the workings were abandoned and traffic over the railway ceased for the second time. During this period, an *ex*-Metropolitan 4-4-0 engine (No. 37) was at work, being transferred to the Mineral Railway by means of a temporary connection laid in from the Great Western Railway at Kentsford Crossing, near Watchet.

In 1911, part of the railway at the Watchet end was leased by Mr. A. R. Angus, an engineer of Sydney, N.S.W., for the purpose of experimenting with a new system of automatic signalling. Although these experiments were conducted for two or three years, nothing definite resulted—in this country, at any rate.

In September, 1913, the writer visited Watchet station and harbour, and also explored part of the railway, walking one day from Washford to Brendon Hill and back. For two miles at the Watchet end the Mineral Railway ran alongside the Great Western Railway, and as this section could very well be seen from the carriage window, it was unnecessary to walk over it.

Leaving the harbour side at Watchet, the line immediately crossed the road on the level and entered the passenger station. This had but one platform, where were located the company's offices, as well as the usual accommodation for passengers. There were also several lines of sidings, a goods shed, and, further up the line, an engine shed. Passing through a cutting and then beneath the Great Western Railway, the line next ran parallel with the latter as far as Washford. Both railways had a station in this village. The Mineral station consisted of one platform, as did all the others on this line. Between Washford and Roadwater there was an intermediate siding known as Torre. Roadwater station, situated amidst very picturesque surroundings, had three lines of sidings and a goods shed. At Combe Row, the terminus for passenger trains, sidings on a more extensive scale were provided, for it was here that the loaded wagons, after being let down the incline, were made up into train loads for Watchet.

Directly connected with these sidings and going off to the left, was the celebrated

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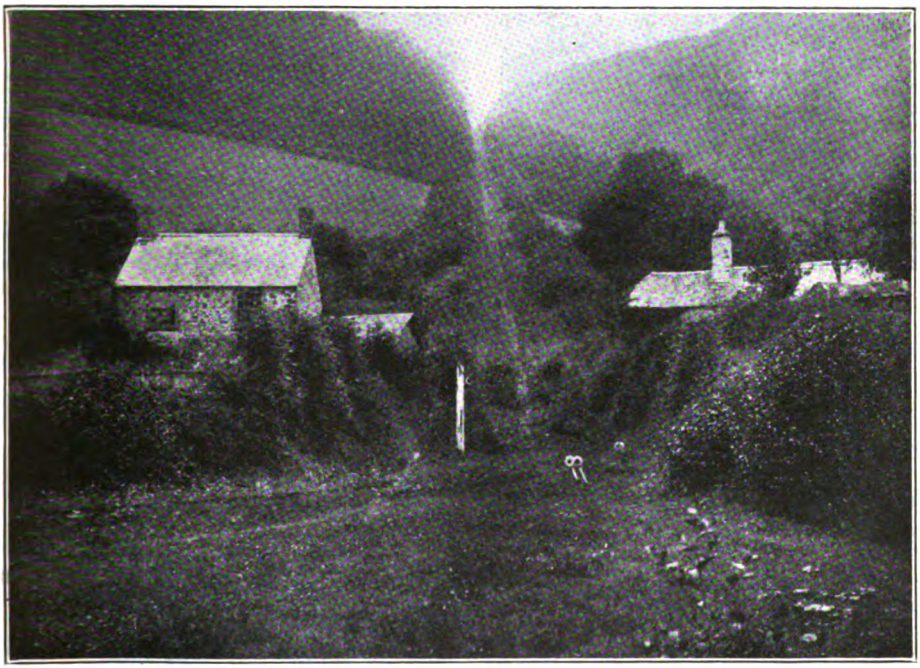
Brendon Incline, ascending abruptly at 1 in 4 for over half-a-mile. Half way up, a bridge carried the tracks across a deep cleft in the hills. On reaching Combe Row, the writer found it to be a most desolate spot, with little or no sign of population, and looking at the grass-grown incline, he could not help contrasting its then neglected condition with that of some years previously, when traffic had been in full swing. After spending some time at Combe Row station, the incline itself was ascended, and this proved a formidable climb, especially as a camera and tripod were carried, and walking was rendered additionally difficult by the neglected state of the permanent way. Arrived at the summit, an examination of the stationary engine house and of Brendon Hill station and sidings brought investigations to an end. In returning, the descent of the incline proved almost as severe as the ascent.



COMBE ROW INCLINE IN SEPTEMBER, 1913.

Except on the Brendon incline, the railway was of single track throughout. A gradual rise was encountered from Watchet but within a mile of Combe Row the gradient steepened to 1 in 43. Latterly, the permanent way was composed of 70-lb. flat-bottomed rails laid in chairs, instead of being spiked direct to the sleepers, as is usual with this type of rail. On the incline, however, only spikes were used. Over this section, descending loaded wagons drew up the empties by means of a wire rope which ran round a pulley wheel fixed at the summit. Locomotives and other heavy loads were worked up and down by winding gear, driven by the stationary engine previously referred to. A bell-signalling apparatus was fixed to enable the staff at the top and bottom to communicate with each other.

In 1913 the whole equipment was in fair order, although, except for a short period, no traffic had worked over the line since November, 1898, and, during the Somerset Mineral Syndicate's occupation, from 1907 to 1909, very little was done in the way of repairs. Owing to the exposed situation of Brendon incline, this section had suffered to a greater degree.

Among other interesting features of

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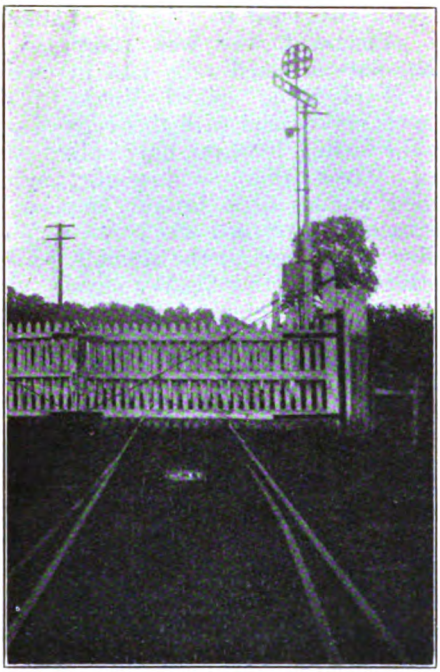

OLD DISC AND CROSS-BAR SIGNAL AT WASHFORD.

the railway were the signals. Of the ancient disc-and-crossbar type, and installed at the opening, they were still in use when the line was closed in 1898. Although, in 1913, some had fallen, those that stood were still in working order.

During the war most of the track was dismantled for use overseas. Time will show whether this removal is the final chapter in the history of the West Somerset Mineral Railway. Such, however, would appear to be the case, for in view of the present day high cost of labour and materials and the thinly populated district served, it seems hopeless to expect that the railway will ever be re-opened. Following the removal of the permanent way, a narrow gauge line was put down between Watchet and Washford for the transport of timber for war purposes.

The last event to be recorded in this article is the expiry of the agreement made in 1864 with the Ebbw Vale Company. This occurred in September, 1919, and up to that time the shareholders had been in the fortunate position of regularly receiving their dividends, notwithstanding the fact that the railway had been closed for all traffic since November, 1898 (except for the two years already noted); surely an unparalleled circumstance in the annals of British railway history!

As a reminder of the West Somerset Mineral Railway's past activities, the writer has in his possession a third-class ticket issued from Washford to Combe Row so far back as June, 1879.

ROADWATER STATION IN SEPTEMBER, 1913.

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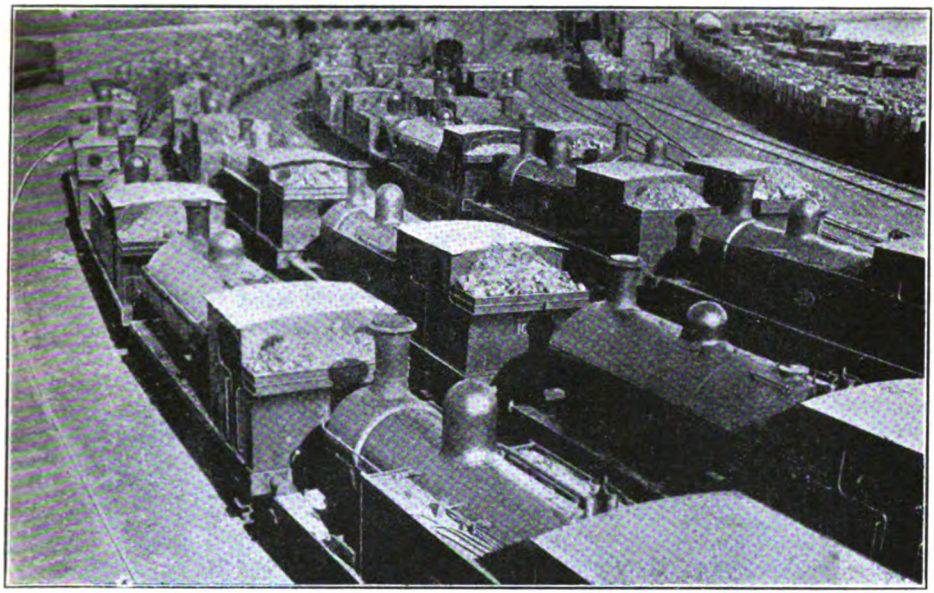

SUNDAY MORNING AT A WELSH RUNNING SHED.

Locomotive Management and Control.

By S. T. JAMES.

THE work of the locomotive department of a big railway, in supplying power for the movement of traffic, is obviously of such importance to the business of transport that its organisation and control has a profound bearing on the efficiency of the railway undertaking as a whole. Our leading railways, recognising the fact, have placed the complete control of all their locomotives in the hands of an official known as the Running Superintendent, and it is the duty of this official to supply an engine and enginemen to haul every passenger or goods train that runs.

Obviously this is by no means a simple undertaking, for traffic requirements are seldom the same for two consecutive days. Specials are constantly being put on and taken off, duplicate trains have to be run at holiday times, and assistant engines are urgently called for whenever a train-load is found to be unduly heavy.

The Running Superintendent has in his charge a number of engine depôts situated at convenient points on the line of the company he serves, and at each are stationed locomotives of various types. Their working is controlled by what is known as the " Diagram " system.

A diagram is really a summary of the work a particular engine has to perform on the day or days specified. Instructions are shown as to the time the enginemen are to be brought on duty and the trips they must work. If the diagram orders a long run that will necessitate the men being relieved or rested *en route*, this is indicated and particulars given of the time and place at which relief is to be provided. Thus the foreman in charge of each locomotive depôt is informed exactly what jobs his engines are to perform, what men are to be utilised for the purpose, and the time each must be brought on duty.

The Controller has three important factors to take into consideration in the arrangement of these diagram instructions. He must get the total work before him performed with as few engines

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and men as possible, he must avoid his locomotives having to run light, and he must obviate the necessity for his men working overtime, which, besides being expensive, is undesirable from the standpoint of public safety.

Much assistance may be obtained in these matters by the active co-operation of the Traffic Department, who endeavour to arrange the timing of their trains to suit the engine-working. To keep the necessity for this well before them, the Controller sends a trusted representative to every meeting at which alterations, additions or withdrawals of trains are to be considered.

The light running of a locomotive is abhorrent to the Controller, yet despite all his efforts and ingenuity it sometimes happens that he has to send an engine to some point from which he cannot arrange a return working. When this happens, he at once asks the traffic department if they can arrange for some kind of a train to run from that point so as to avoid a waste of engine power. The Traffic Department may not be able to oblige by putting on a new train, when the only alternative to the engine running light is for it to be kept over for some job on the following day, and the enginemen lodged. The deciding factor is economy. It may be more expensive to pay lodging money, &c., than to run the engine back light.

The diagrams are arranged so that the enginemen shall put in not more than the standard eight-hour day. This is, of course, frequently exceeded, particularly by men on goods trains, through late running and delays. It is very seldom that the men are "diagrammed" for more than eight hours, though such a course has sometimes to be adopted if it results in more satisfactory working, as on the occasions where it would prove more expensive to relieve men *en route* than to let them finish the run.

In this country, it is customary for alterations in the passenger service to be put into operation twice or three times a year. There are additional trains for the summer service commencing in July, and corresponding winter withdrawals in October, whilst some companies have an intermediate spring service commencing in April or May.

On each of these occasions the Locomotive Controller has to revise his system of diagrams to meet the altered conditions. At a casual glance it would seem that the only necessity would be for so many more or less locomotives to be ordered out, but such is not the fact.

Suppose, for instance, a given passenger engine may work the 6 a.m. train from Birmingham to Sheffield, arriving about 9 a.m. Naturally, it is not left idle long. It may then work the 9.30 a.m. Sheffield to Derby, arriving 10.45, the 11 a.m. Derby to Chesterfield arriving noon, and pick up the running of the Sheffield to Bristol express leaving Chesterfield at 12.20 p.m. and arriving back at Birmingham by 2 o'clock, when the enginemen's eight hours are up, and they are relieved.

The engine thus hauls four trains during the day. When alterations are made, any of the four may be cancelled, upsetting the whole working, for this engine naturally cannot haul the Sheffield Derby train when in consequence of the Birmingham–Sheffield being cancelled, it is not at Sheffield! If the worst comes to the worst it will be run light from Birmingham to take up the working of the Derby train, but this will not be allowed until the working of every other engine in the district has been overhauled and reconsidered with a view to a reorganisation that will avoid it.

In arranging the withdrawal and addition of trains, the Traffic Department has the Locomotive Controller's assistant to indicate how awkward such and such an alteration will be, but in spite of this, difficulties frequently occur, and other considerations may justify the Locomotive Controller being over-ruled when it comes to a question of whether or not a certain train shall run.

The travelling public is often puzzled by the alterations in passenger services. They see a fairly busy train withdrawn and an almost empty one continued, and laugh at the ignorance of those who make such an arrangement. They little think that the secret of it lies with the Locomotive Running Superintendent, who prefers to draw a half-empty train rather than run his engine light, and who has found it necessary, in order to knock off a useless train, also to discontinue the

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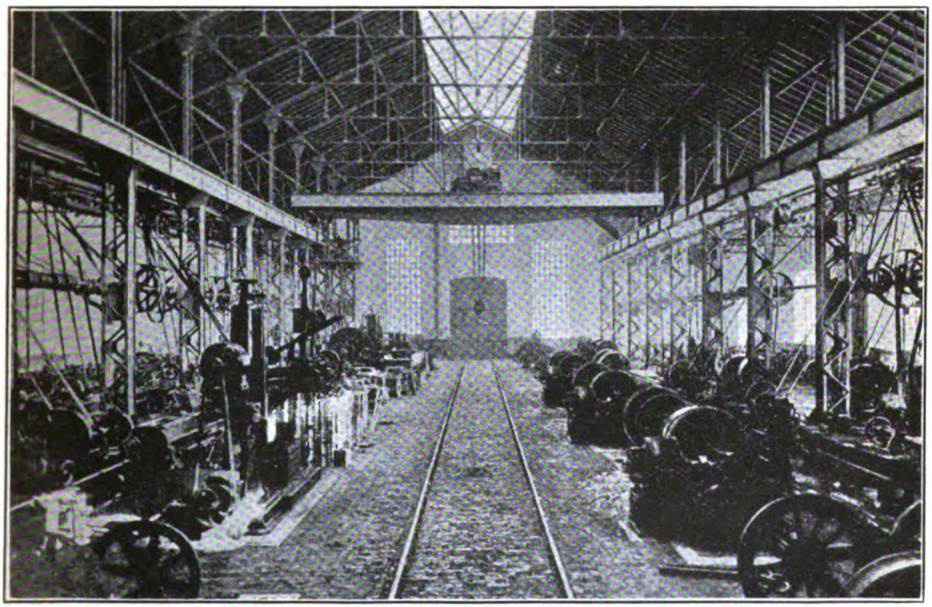
fairly busy one that the engine hauled on its return journey.

But the most harassing work of the Controller is in the provision of power for the "Specials" so constantly called for. As far as possible, lists of those that will be required are supplied weekly, in advance, and the Controller makes a summary of them all. He then decides which depôt is to supply the engine for each, which class of engine will be most suitable, what trainmen will be required, whether relief *en route* will be necessary and if so what arrangements are to be made for it, what return load can be obtained, or, if none is available, whether the engine is to return light or remain over for work on another day. Having decided such points as these, he "diagrams" all concerned so that they may carry out the working decided upon.

During the busy season when passenger specials are numerous, considerable ingenuity has to be exercised in fixing up the engine workings, if the best results are to be obtained. It is amazing what a number of points have to be watched.

One would naturally think that the Locomotive Depôt nearest the place from which a special is to start would be called upon to supply the engine, but this is not always so, for that particular depôt may not have a suitable engine spare at the time required. It may indeed happen that there is no suitable engine at any near shed—in which circumstances efforts must be made to find a load for a suitable engine from a distant shed to work forward to the point from which it is to take up the haulage of the special. People are surprised at times to see huge express engines attached to local and slow trains, or small engines pulling expresses, but the Locomotive Controller has a good reason for the apparent anomaly.



A LOCOMOTIVE REPAIR SHOP.

Both excursions and other specials are sometimes worked by engines and men on ordinary "diagram" jobs. Perhaps a locomotive has an hour to wait before it takes up the working of another train and that hour may profitably be spent in taking a special forward, another engine coming on later for the regular duty. In order to be able to take advantage of all these varying circumstances, the Controller must obviously have the engine working of the entire system at his finger-ends, a difficult task perhaps, but, once

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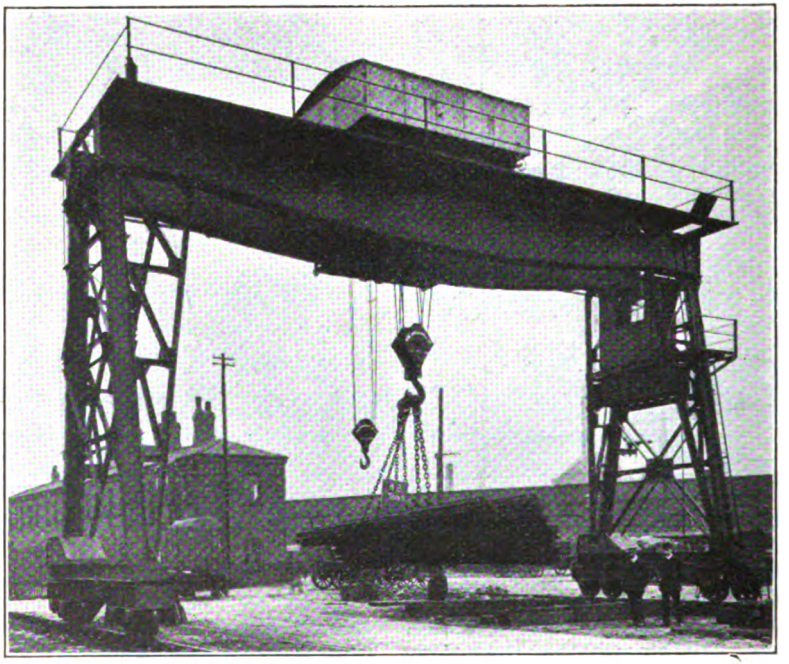
accomplished, the economies it yields are truly amazing!

Another difficulty lies in the fact that some types of engines cannot be allowed to do certain work, or to run over certain stretches of line. Perhaps their wheel-base will not allow them to travel safely over certain severe curves, or to pass over siding and auxiliary lines at anything more than a crawl. There are countless technical and engineering difficulties, which the Controller has to be familiar with.

ELECTRIC "GOLIATH" CRANE AT ARDWICK, GREAT CENTRAL RAILWAY.



THIS 40-ton four-motor electric "Goliath" crane, built to the order of the Great Central Railway, has been installed at Ardwick goods station, Manchester. The crane has a span of 49 ft. 9½ in., height of lift 22 ft. 7 in., and is designed to lift a load of 40 tons on the main hoist. The illustration shows it lifting a test load 8 tons in excess of the design load in the goods yard at Ardwick. Auxiliary hand-gear is fitted to all motions so that the crane may be operated at slow speeds in the event of failure of the electric supply. This crane is much used in connection with the transfer of "flats" from wagon to lorry and *vice versa*, as well as for general heavy traffic handled at this depôt.

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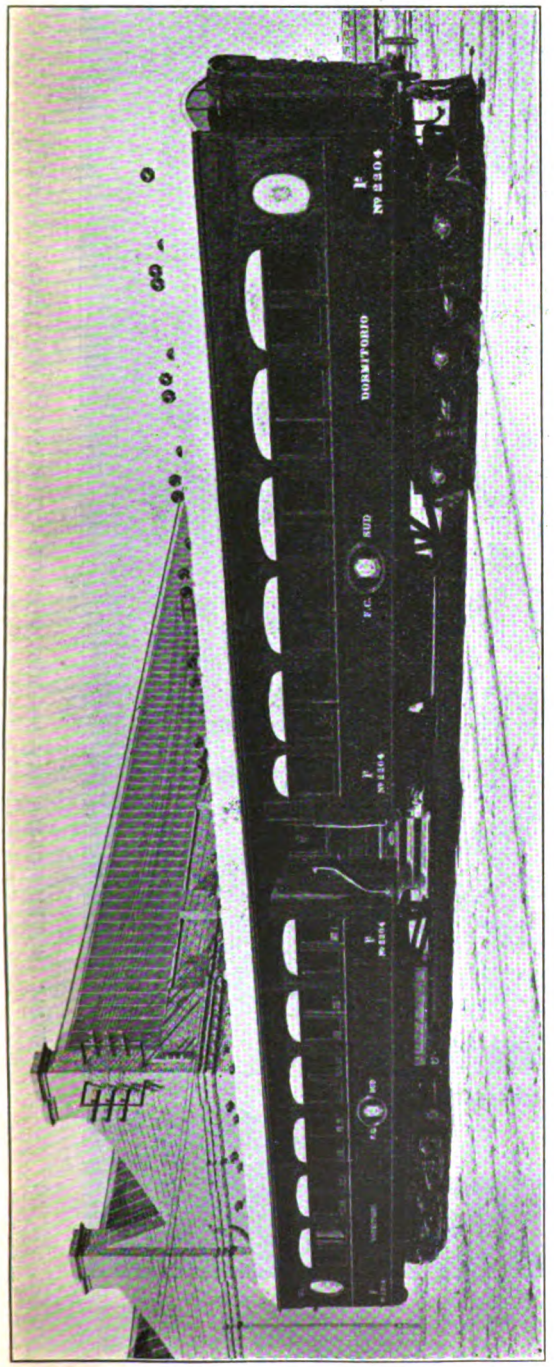
New Passenger Rolling-Stock, Buenos Ayres Great Southern Railway.



NEW CENTRE-DOOR SLEEPING CAR (CLASS K.5), BUENOS AYRES GREAT SOUTHERN RAILWAY.

RECENT passenger rolling-stock constructed at the Buenos Ayres Great Southern Railway workshops in the Argentine, includes three types of coaches—first-class day saloons (Class A.11), restaurant cars (Class K.5) and sleeping coaches (Class R.6). The vehicles were manufactured almost in their entirety in the Argentine, the purchase of parts from Europe and elsewhere being confined to such details as wheels, axles, steel plates, channels and electric lighting equipment.

The underframes of all these cars are of the Livesey-Gould cantilever type, and are carried on three-axle bogies.

Somewhat novel features have been introduced in the construction of the bogies, which improve the riding and minimise the rolling noise usually transmitted to the body of the cars. This improvement has been obtained by a group of rubber springs inserted between the bogie bolster and cradle, as well as a flexible drive substituted for the usual rubbing plate drive. To obtain the required rigidity of body in such comparatively long cars, the floors and roof were made in two superimposed layers of tongue and grooved boarding placed diagonally to the axis of the cars, and each layer in an opposite direction to the other. That the desired effect has thus been obtained is proved by the steady movement of the cars, even when riding over indifferent tracks at good speed.

The following are the principal dimensions and particulars

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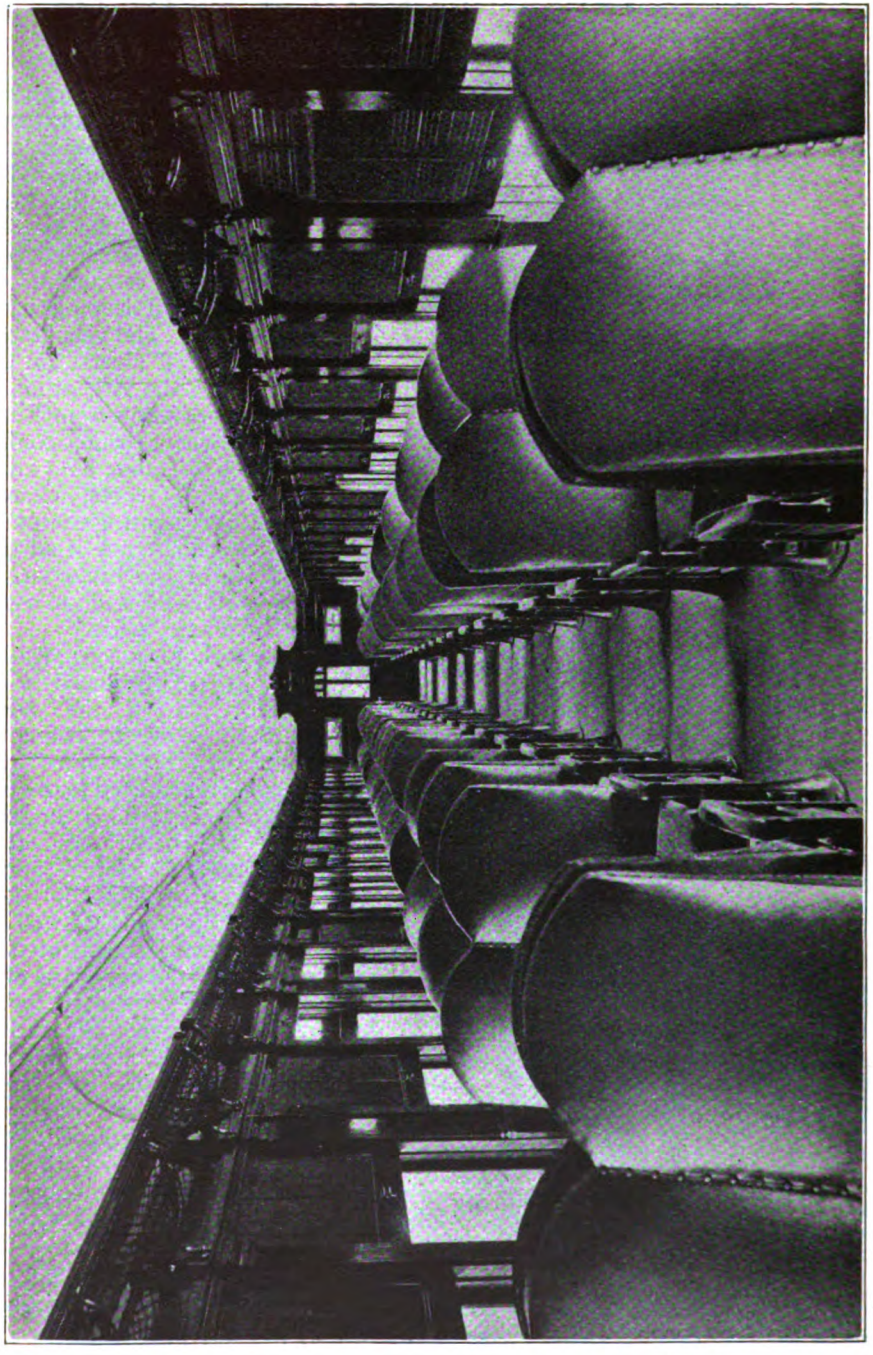

INTERIOR OF FIRST-CLASS DAY SALOON, BUENOS AYRES GREAT SOUTHERN RAILWAY.

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of the timber used in the construction of the day saloons :—

Dimensions.

Length over buffers ..	82 ft.
Length over body ..	80 ft. 2 in.
Total width	10 ft. 6 in.
Distance between bogie centres	58 ft. 4 in.
Seating capacity	84
Total weight (approx.)	52,000 kilos.

The exterior is of cedar, while the interior lining is of Incienco Colorado, a semi-hard wood grown in the country, which has the appearance of mahogany. Capacity, as stated, is for 84 passengers and suitable lavatory accommodation is provided at both ends of the cars, as well as a space for the storage of handbags, &c. Seats are of the turn-over back type and of a somewhat novel design, being provided with an arm rest in the middle, so that each passenger is allotted his proper seat. The tops of the backs are curved—opera type—which greatly diminishes the heaviness that square backs usually present.

The sleeping cars have the following principal dimensions :—

Length over buffers ..	81 ft.
Length over body	77 ft. 8 in.
Total width	10 ft. 6 in.
Distance between bogie centres	58 ft. 4 in.
Capacity	26 beds.
Total weight (approx.)	52,000 kilos.

Timber used in their construction, except for the interior, is the same as that used for the day saloons. Interior finish is dark, with light panelling, the frames being made of Peteribi and the panelling of Tipa. These cars are not provided with end platforms, access being obtained by a central opening into a small hall. Two corridors running in the opposite side of the coach lead to the various compartments placed on either side of the hall, and communicate with an end door for the purpose of transit from one vehicle to another. The design permits of a better utilisation of the car length.

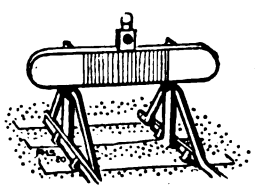
Each coach contains 11 sleeping compartments of two beds each and one of four beds, a total of 26 beds, and each berth is provided with a reading lamp. To facilitate supervision of children when families travel together, fou of the two bed compartments can be turned into four-bed compartments by means of a sliding door provided in the dividing partition. A suitable lavatory with a wide marble wainscotting, together with a linen cupboard, is provided at each end of the car.

The restaurant cars are dimensioned as follows :—

Length over buffers ..	81 ft. 3½ in.
Length over body	75 ft.
Total width	10 ft. 6 in.
Distance between bogie centres	58 ft. 8 in.
Seating capacity	56
Total weight (approx.)	52,000 kilos.

Timber used in the construction of these cars is the same as the first-class day saloons. The dining saloon is arranged to accommodate 56 passengers at 14 detachable tables placed at the sides of the saloon. Seats are of the fixed type, with lifting bases, so as to permit of easy access. Ample kitchen accommodation is provided, including all modern appliances, such as ice chest, pantry, hot and cold water, oven, &c. Next to the kitchen a serving room is arranged, where dishes are made ready for the waiters. This is fitted with ample cupboards for crockery, linen, wash basins, &c. Between the kitchen and the saloon a bar, with suitable counter, is installed. From the counter a clear view of the saloon is commanded, which enables the chief of the car to keep a proper watch. At the saloon end of the car suitable wine bins, with bottle and ice racks, are arranged.

Lighting is electric in all vehicles, on the Stone system, and the internal finish, appointments and fittings are in accordance with the latest practice for rolling-stock of the respective classes.



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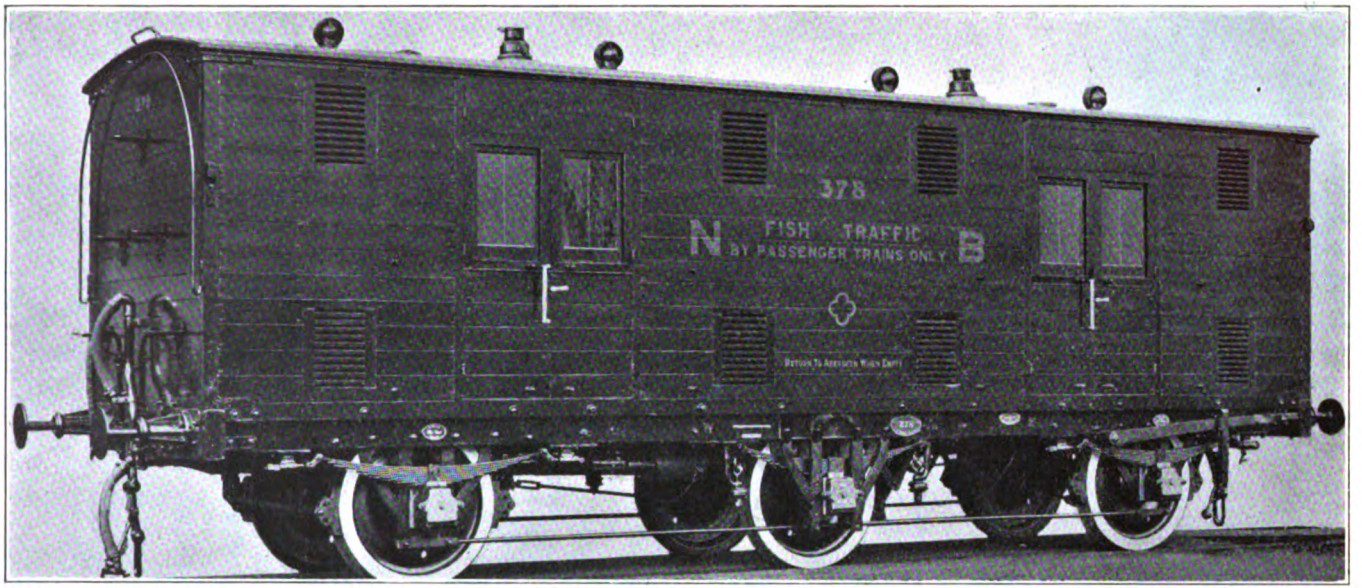
NEW SIX-WHEELED FISH VANS, NORTH BRITISH RAILWAY.



BUILT by Hurst, Nelson & Co, of Motherwell, several new fish vans of the class illustrated have recently been taken into stock by the North British Railway. They were designed by Mr. W. Chalmers, Chief Mechanical Engineer, and are adapted for conveying milk when desired. The bodies are double-lined, with louvre ventilators on the sides, top and bottom. Both Westinghouse and vacuum brake equipment is provided. Steam heating pipes and connections are also included. Length over body is 30 ft., width 7 ft. 6in., wheelbase 20 ft., height inside 7 ft. 2½ in.

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Locomotive and Train Working in the latter part of the 19th Century.

THE HIGHLAND RAILWAY. [No. II.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

SOMETHING may now be said of the train service on the main line between Perth and Wick. Taking the year 1880, the Highland day commenced at Perth with a northbound train which left that station at 12.40 a.m. It was duly labelled "Government," and earned the title by being about as slow and efficient. It disappeared into the wilds of the Grampians, but eventually emerged, and got to Inverness at 8.50 a.m. after a wild night, during which it travelled 143¾ miles in 8 hrs. 16 min. with many stops. But at Inverness there was the compensating advantage of 50 min. for breakfast, provided that the train made a punctual arrival. The connecting train for the north left Inverness at 9.40 a.m., and reached Wick at 5.40 p.m. Such journeys had to be thought over before being undertaken; there were neither corridor carriages nor steam heating, but I believe the homely foot-warmer was sometimes to be found in cold weather.

The great down train of the day left Perth at 9.30 a.m. This was the down limited mail which had left Euston at 8.50 p.m. on the previous evening, and carried practically all the passengers who were travelling from London to the Highlands. It arrived at Inverness at 2.45 p.m., after averaging just 25 m.p.h. from Perth, including stops. This train reached Wick at 10.20 p.m., and I suppose the London letters would be delivered the next morning.

There was one other down train, which left Perth at 4.30 p.m., and arrived at Inverness at 10.20 p.m. This had no connection for stations north of Inverness.

In the opposite direction there was also a long night journey from Wick (dep. 12.10 a.m.) to Inverness (arr. 9.35 a.m.). This was the up mail, which continued

Photo.] [*Loco. Publishing Co., Ltd.*

4-4-0 MIXED TRAFFIC ENGINE No. 70 (SERIES 70 AND 85-88).

Designed by Mr. D. Jones and built at Inverness, 1882. Coupled wheels, 5 ft. 3 in. diam. Cylinders, 18 in. by 24 in.

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its journey from Inverness at 10.18 a.m., and reached Perth at 3.33 p.m. The expression "continued its journey," is not, however, strictly accurate. There was one through coach which did so, but there were no through trains between the northern and southern sections of the railway. Inverness is a terminal station, and passengers from the north, unless in the through carriage attached to the mail trains, had to change into the train which left for the south.

There was also another train by which passengers could get through from Wick to Perth if they liked to spend much time in doing it. This left Wick at 11.30 a.m., and arrived at Inverness at 7.35 p.m., to Strome Ferry there were two trains each way per day. This line was worked by two 4-4-0 engines of the 5 ft. or goods class, Nos. 7 and 10, at one time named *Dingwall* and *Duncraig*. Originally they had been of the standard 2-4-0 type, but bogie engines had been found to be absolutely necessary for negotiating the sharp curves on this line, and the two engines in question had been specially altered for the purpose. Incidentally No. 10 was the first bogie engine to be used on the Highland line, and was the forerunner of the long line of 4-4-0 engines which followed it. These two engines when altered, had the cylinders enlarged to 17 in. by 24 in.

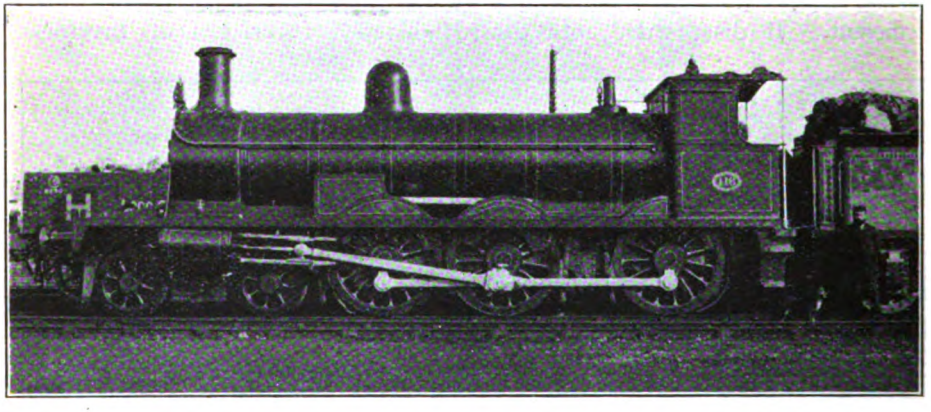

Photo.] [*Loco. Publishing Co., Ltd.*

4-6-0 MAIN LINE GOODS ENGINE No. 116 (SERIES 103-117).

Designed by Mr. D. Jones. Built by Sharp, Stewart & Co., 1894. Coupled wheels, 5 ft. 3 in. diam. Cylinders, 20 in. by 26 in.

where they could wait and have dinner before leaving by the southbound train at 10.0 p.m., to reach Perth at 7.10 a.m., in time for breakfast.

But Sunday being the Sabbath, the Highlanders thought that the best thing to do with the up mail train from Wick would be to knock some two hours off its schedule time, and consequently curtail the amount of desecration required in running it on that day. So instead of leaving Wick at 12.10 a.m., it did not depart until 2.30 a.m., but nevertheless arrived at Inverness at 9.50 a.m., only 15 min. later than its weekday arrival. Truly the Sabbath had its advantages in Caithness-shire.

On the long "Skye line" from Dingwall

The above engines were the prototypes of a number of very similar bogie "goods" engines, some of which took their places on the Dingwall and Skye branch. The new engines had 5 ft. 3 in. coupled wheels, and 18 in. by 24 in. outside cylinders. The first of them, No. 70, came out from Inverness Works in 1882 and was put to work on the above line. It was not, however, until 1892 that the next one appeared, and from that date until 1898, seven others, all built at Inverness, appeared, having the Nos. 85, 86, 87 88, 5, 6, and 7. In 1899 the last three were renumbered 32 to 34 by Mr. Drummond, who added another of the class, No. 48, in 1901. In addition to working the "Skye" line they proved useful engines

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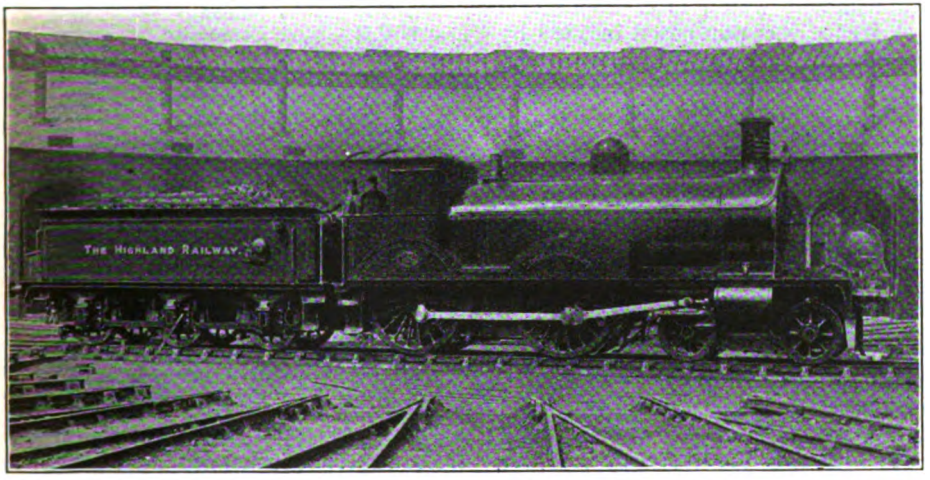
for piloting main line trains over the heavy banks. None of these engines ever bore names.

There was and is one enemy of the Highland railway which I have not mentioned—the "Snow Fiend"—probably the greatest of all the Company's troubles in former years. It sometimes happened that on exposed portions of the railway, goods trains would be embedded for weeks, let alone days. In 1881, the most important main line between Inverness and Perth was closed for six weeks. Matters in this respect are now much improved, since the erection at the worst places, where snow blocks most frequently occurred, of extensive fences, behind which the snow drifts gather before they reach the railway.

A feature of the Highland engines in the days of Mr. Jones's superintendency was the curious chimney with louvres in the front. The chimney was double and the louvres were placed in the outer casing about half-way up. The intention was to counteract the effect of a high wind, which would check the draught on the fire, by producing a current of air up the outer casing, which in turn induced the necessary draught through the inner chimney. Many of the engines had a spark arrester just below the foot of the chimney in the top of the smoke-box.

The name of Mr. Stroudley is associated in the minds of many with the bright yellow colour of his locomotives on the "Brighton" railway. But before he migrated from Inverness to Brighton he had adopted the same colour, with the well-known claret coloured underframes, for the Highland engines, and his successor Mr. Jones, continued this style of painting for about 15 years longer. When the change to olive green took place I do not exactly remember, but it occurred somewhere about the middle of the "eighties." Mr. Stroudley's brass number plates were of exactly the same design on both the Highland and the Brighton lines, the only difference being that the background was painted red in the case of the Highland and blue on the Brighton engines. These number plates were retained on the Highland until Mr. Drummond's time.



4-4-0 EXPRESS ENGINE No. 128, "LOCH LUICHART ("LOCH" CLASS, SERIES 119-133).

Designed by Mr. D. Jones. Built by Dübs & Co., 1896. Coupled wheels, 6 ft. 3 in. diam. Cylinders, 19 in. by 24 in.

Between 1883 and 1888 13 new engines of the 4-4-0 passenger class were added to the stock. They were generally similar to Nos. 60 to 69 of 1874, but were slightly heavier. They had 6ft. 3 in. driving wheels and 18 in. by 24 in. cylinders. Nos. 76

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to 84 had 160 lb. pressure. Their names and numbers were as below :—

No.	Original Name.	Renamed.
72	*Bruce*	*Grange* (1886).
73	*Thurlow* ..	*Rosehaugh* (1898).
74	*Beaufort.*	
75	*Breadalbane.*	
76	*Bruce.*	
77	*Lovat.*	
78	*Lochalsh.*	
79	*Athole.*	
80	*Stafford.*	
81	*Colville.*	
82	*Fife.*	
83	*Cadboll.*	
84	*Dochfour.*	

Nos. 76 to 83 were built in 1886 by the Clyde Locomotive Works at Glasgow, an establishment which after about two years existence was purchased in 1888 by Sharp, Stewart & Co., Limited, who then moved from Manchester to Glasgow, and gave the works the old name of "Atlas Works," which had been borne by their Manchester shops. Nos. 76 to 83 were the first engines to be built by the Clyde Locomotive Works.

By 1888 the train service had improved somewhat for the better. The Scotch trains from London had been considerably accelerated, and the "Highland" express from Euston, now reached Perth in time to allow a departure for Inverness at 7.50 a.m. (instead of 9.30 a.m.), where it arrived at 11.50 a.m. This 4-hour timing for the 143¾ miles of single line with very severe gradients, was a very creditable performance. The average speed, exclusive of stops, was 38½ m.p.h. The train arrived at Wick at 6.0 p.m., the speed over the northern section being 27 m.p.h., inclusive of stops, and 30 m.p.h., exclusive of stops. In the case of the up train the speed was somewhat slower between Wick and Inverness, the train taking 6½ hours.

At the risk of plagiarism I feel that I must quote from Foxwell, who gave a description of the 7.50 a.m. train from Perth, which cannot be improved. In "Express Trains, English and Foreign," he wrote :—"In July and August this 7.50 train is the unique railway phenomenon. Passenger carriages, saloons, horse-boxes and vans, concentrated at Perth from all parts of England, and intermixed to make an irregular caravan. Engines are attached fore and aft and the procession toils pluckily over the Grampians. Thus on August 7, 1888, this train sailed out of Perth composed as follows :—

L.B.S.C.R.	.. Horsebox.
,,	.. ,,
,,	.. Carriage van.
,,	.. Horsebox.
L.N.W.R.	.. ,,
N.E.R.	.. ,,
L.N.W.R.	.. Saloon.
,,	.. Horsebox.
Mid. R.	.. Saloon.
,,	.. Luggage van.
,,	.. Carriage truck.
,,	.. Horsebox.
L.N.W.R.	.. ,,
N.B.R.	.. Luggage van.
,,	.. Horsebox.
,,	.. ,,
,,	.. ,,
E.C.R.	.. Sleeping car.
G.N.R.	.. Saloon.
W.C.R.	.. Composite.
Mid. R.	.. ,,
L.N.W.R.	.. Luggage van.
L.S.W.R.	.. Horsebox.
W.C.R.	.. Composite.
L.N.W.R.	.. Horsebox.
,,	.. Meat van.
H.R.	.. P.O. van.
,, ..	.. Luggage van.
,, ..	.. third-class passenger.
,, ..	.. first-class passenger.
,, ..	.. second-class passenger.
,, ..	.. third-class passenger.
,, ..	.. Luggage van.
,, ..	.. third-class passenger.
,, ..	.. first-class passenger.
,, ..	.. third-class passenger.
,, ..	.. Guard's van.

9 companies, 36 carriages, 2 engines in front, 1 put on behind at Blair Athol. Left Perth 20 min. late. Left Kingussie 72 min. late."

After getting over one's astonishment at the composition of the above train, the best regular express of the day, and not a "special," be it observed, a few pertinent observations occur to one's mind. In the first place the couplings of the leading London, Brighton and South Coast horse-boxes must have been subject to a considerable strain, though whether the Highland officials at Perth who made up the train gave this matter due consideration does not appear. It may be remembered in extenuation that with the exception of the four-wheeled horse-boxes and carriage trucks, the rest of the train was composed entirely of six-wheeled stock, the E.C. sleeping car alone possibly excepted, and that there was not a load of heavy bogie coaches mixed up in the assortment. Then there was the inordinate length of train of 36

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vehicles, and in this respect I am not sure whether the Highland Railway was not transgressing a Board of Trade regulation. Writing from memory I think that a rule was made about the year 1884 to the effect that no passenger train was to exceed an amount of stock equivalent to 20 six-wheeled coaches. But then the Board of Trade spent much time in making rules and regulations, some of which might possibly have been carried out on a large English railway, but which were utterly impossible when application of them was intended for a line like the Highland.

Finally, one wonders why the Highland Railway did not use six-coupled engines for their trains over the hills, especially when three engines are obviously a not very economical proposition. The six-coupled engines came at a later date, it is true, but they might with advantage have come before.

By 1891 the down train service had been somewhat improved. The tourist express left Perth at 5.55 a.m., though it took 4 hours 45 min. to Inverness with one stop less than the "Limited Mail," which now departed from Perth at 7.5 a.m., and

4-4-0 ENGINE No. 15, "BEN LOYAL" (SMALL "BEN" CLASS, SERIES 1–17).

Designed by Mr. P. Drummond. Built at Inverness, 1901. Coupled wheels, 6 ft. diam. Cylinders, 18¼ in. by 26 in.

Consequently the latter Company spent an equal amount of time in breaking or evading the impossible conundrums which the Whitehall wiseacres set them, for had any attempt been made to carry them out, traffic on the Highland would have come to a dead stop. Amongst many other things to which the Board of Trade objected was the use of a banking engine behind the train, and they wanted the pilot engine in front. The Highland railway did both; on such trains as the one just described the Board of Trade got its pilot engine in front, and the Highland put its "banker" behind and completed the edifice. However, the Board had the pleasure of making the regulations, and the Highland authorities read them and carried on their "business as usual," so everybody was satisfied.

required only 4 hours. The mail was timed as follows:—

Miles.			
	Perth	dep.	7.5 a.m.
35¼	Blair Atholl ..	,,	8.0 ,,
71½	Kingussie ..	,,	9.5 ,,
87¼	Boat of Garten	,,	9.29 ,,
95¾	Grantown ..	,,	9.40 ,,
119	Forres	arr.	10.15 ,,
		dep.	10.20 ,,
128½	Nairn	,,	10.38 ,,
143¾	Inverness ..	arr.	11.5 ,,

From Inverness to Wick, 161¼ miles, was a six hour run as before. The up mail, which left Wick at 12.10 a.m., ran on exactly the same schedule as in 1880, and still maintained a timing of 2 hours better on Sunday mornings. But there was also a train which left Wick at 8.0 a.m., and reached Perth at 7.0 p.m. The best run on the line was performed

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by this train, which covered the 36¼ miles section from Kingussie to Blair Atholl in exactly 1 hour over the Dalnaspidal summit, which lies almost exactly half-way between the two stations. The climb to the summit involves several miles of 1 in 80, 1 in 95, and 1 in 100, and the performance was certainly equal to many 50 to 53 m.p.h. runs on the large English main lines.

In 1892, 12 more of the standard type of 4-4-0 passenger engines were built by Neilson & Co., as follows :—

No.	Original Name.	Renamed.
89	*Sir George.*	
90	*Tweeddale*	*Grandtully.*
91	*Strathspey.*	
92	*Strathdearn*	*Glendeane.*
93	*Strathnairn.*	
94	*Strathtay.*	
95	*Strathcarron.*	
96	*Glentilt.*	
97	*Glenmore.*	
98	*Glentruim.*	
99	*Glentromie.*	
100	*Glenbruar.*	

These engines were of the same general dimensions as Nos. 76 to 83, *i.e.*, the coupled wheels had a diameter of 6 ft. 3½ in., and the cylinders were 18 in. by 24 in. The boilers, which carried 160 lb. pressure, were, however, of a larger diameter, the fireboxes were larger, and the total heating surface was increased to 1,242 sq. ft. They were put to work on the Inverness–Perth main line, where they remained until they were replaced in 1896 by the "Loch" class.

The stock of passenger tank engines was increased by half-a-dozen between 1890 and 1893. In 1890 a small 0-4-4 saddle tank engine, No. 13, *Strathpeffer*, was built at Inverness for working the Strathpeffer branch. This engine had inside cylinders 14 in. by 20 in., the coupled wheels being 4 ft. 3 in. in diam. The other five engines, Nos. 101, 102, 11, 14 and 15 were purchased in 1892–3 from Dübs & Co., who designed them for a South American railway. They were 4-4-0 side tank engines with outside cylinders, 16 in. by 22in., and coupled wheels, 5 ft. 3 in. diam. They worked on the Burghead and other branches.

The absence of six-coupled engines has been mentioned, but in 1894, Mr. Jones remedied the defect, and in doing so he made a most radical departure.

No less than 15 engines were built by Sharp, Stewart & Co., which were remarkable in being the first of the 4-6-0 type put to work in this country, and moreover, were the largest main line engines then running. They were styled goods engines, and generally intended for goods traffic, but were very useful in helping with the heavy passenger traffic during the tourist season. These celebrated engines, Nos. 103 to 117, had cylinders 20 in. by 26 in., coupled wheels 5 ft. 3 in. diam., bogie wheels, 3 ft. 3 in. diam., and 175 lb. pressure. The boiler had a total heating surface of 1,672½ sq. ft., and a grate area of 22·6 sq. ft. The engines weighed about 56 tons in working order, of which 42 tons represented adhesive weight.

The last engines designed by Mr. Jones, which were built in 1896 by Dübs & Co., were more powerful than and considerably different from their predecessors. All the previous 4-4-0 engines were directly derived from Allan's early design, and retained a deep outside frame plate at the leading end, to which the outside cylinders were fastened. In the new engines, this outside frame was discarded and the cylinders were fastened only to the inside frames in the usual manner. The cylinders were 19 in. diam. by 24 in. stroke, and the coupled wheels 6 ft. 3 in. diam. The boiler, which carried 175 lb. pressure, had a total heating surface of 1,295 sq. ft., of which the firebox provided 119 sq. ft. The grate area was 20½ sq. ft., and the total weight of the engine in working order was 47½ tons. The engines were originally supplied with piston valves, but these gave a good deal of trouble, so that two or three years afterwards balanced slide valves were substituted for them. A feature of all the Highland engines, which has not been mentioned, was that all of them, except the few small tank engines, not designed by Mr. Jones, had Allan's straight link motion, being in this respect direct derivatives from the earliest engines on the line.

The new engines were as follows :—

119	*Loch Insh.*	127	*Loch Garry.*
120	*Loch Ness.*	128	*Loch Luichart.*
121	*Loch Ericht.*	129	*Loch Maree.*
122	*Loch Moy.*	130	*Loch Fannich.*
123	*Loch Andorb.*	131	*Loch Shin.*
124	*Loch Laggan.*	132	*Loch Naver.*
125	*Loch Tay.*	133	*Loch Laoghal.*
126	*Loch Tummel.*		

The "Lochs" immediately replaced the earlier 4-4-0 engines on the Perth-Inverness main line, and many of the "76"

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and "90" classes emigrated to the northern section between Inverness and Wick, where they, in their turn, took the places of the older 2-4-0 engines 28 to 35 and 46 to 55, which were beginning to be broken up.

The "Loch" class continued to work between Inverness and Perth until Mr. P. Drummond's "Castle" class (4-6-0) replaced them in 1900–2, when many of the "Lochs" in their turn, went northwards.

In 1898 the direct line between Aviemore and Inverness was opened, though not in time for the summer tourist traffic. From this time, Grantown, Forres and Nairn were short circuited from the main line, and were in a sense relegated to a siding. The distance from Perth to Inverness was reduced from 143¾ miles to 118 miles, a saving of 25¾ miles. But although shorter, the new line is in reality more difficult in the matter of gradients, in spite of the elimination of the Dava bank. The ruling grade now became 1 in 60 instead of 1 in 70, as was the case previously, and the line falls 1,300 ft. from the summit to Inverness, about 22¾ miles, in long stretches of 1 in 60 and 1 in 70.

In 1898 the best down train via the old road was the "Limited Mail," which left Perth at 6.15 a.m., and reached Inverness at 10.15 a.m., taking the usual 4 hours. The best up train which departed from Inverness at 3.5 a.m., took 3 hrs. 55 min. to Perth.

The opening of the new line produced an acceleration of 45 min. in 1899, the timings of the best down and up trains being as follows :—

	Down.	Up.
Perth ..	dep. 6.15 a.m.	7.0 a.m. (arr.)
Blair Atholl	.. 7.10 ,,	6.11 ,,
Kingussie ..	.. 8.15 ,,	5.15 ,,
Aviemore ..	arr. 8.30 ,,	4.55 ,,
,, ..	dep. 8.35 ,,	4.50 ,,
Inverness ..	arr. 9.30 ,,	3.50 ,, (dep)

The run from Aviemore to Inverness, 34¾ miles in 55 min., including the 12 mile climb, much at 1 in 60, was an excellent piece of work, and the 60 min. timing in the opposite direction, over which the gradient is longer, was even better. On the northern section the timing from Inverness to Wick still remained 6 hrs., though the opening of the new line now made the arrival time at Wick 3.50 p.m. For some reason, however, the up limited mail, which now left Wick at 8.40 p.m., required 6 hrs. 40 min. to Inverness.

When Mr. Jones resigned the superintendency of the locomotive department at the end of 1896, the Highland was an outside cylinder line. Mr. Peter

Photo.] [*Loco. Publishing Co., Ltd*

4-6-0 EXPRESS LOCOMOTIVE, No. 143, "GORDON CASTLE."

Designed by Mr. P. Drummond. Built by Dübs & Co., 1900. Coupled wheels, 5 ft. 9 in. diam. Cylinders, 19½ in. by 26 in.

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Drummond, who succeeded him immediately changed over to inside cylinders, just as his brother had done on the Caledonian in 1883, and on the London and South Western in 1897. In fact, in the middle of 1898 there was not a single railway in the kingdom which was building outside cylinder engines, excepting a number of four-wheeled shunting tank engines, known in Scotland under the name of "pugs." Mr. Drummond's first express engines for the Highland were of the inside cylinder 4-4-0 type, with all the Drummond characteristics of the day, such as were to be found on the North British and Caledonian Railways, and were appearing on the London and South Western Railway. These engines known as the "Ben" class, had 6 ft. coupled wheels, and 18¼ in. by 26 in. cylinders, and a total heating surface of 1,175 sq. ft., of which the firebox provided 115 sq. ft. They carried 175 lb. pressure and weighed 46¼ tons in working order. Up to the end of the century the 14 engines given below had been built, of which Nos. 1 to 8 came from Dübs & Co. in 1898, and the remainder were built at Inverness in 1899-1900.

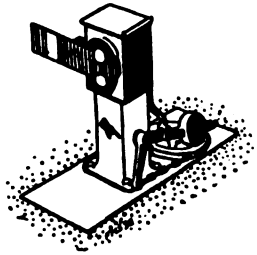
1 *Ben-y-Gloe.*
2 *Ben Alder.*
3 *Ben Wyvie.*
4 *Ben More.*
5 *Ben Vrackie.*
6 *Ben Armin.*
7 *Ben Alvow.*
8 *Ben Clebrig.*
9 *Ben Rinnes.*
10 *Ben Slioch.*
11 *Ben Macdhui.*
12 *Ben Hope.*
13 *Ben Alisky.*
14 *Ben Dearg.*

From the point of view of power the "Ben" class had a tractive force slightly greater than that of the "Loch" class, but their boiler power was considerably less. They therefore did not regularly replace the "Loch" class on the Perth line, but worked north of Inverness, and on the Elgin and Keith trains. There were in all 20 of these engines by the end of 1906, afterwards known as the "small Ben" class, to differentiate them from the similar engines with much larger boilers which Mr. Drummond built in 1908-9, known as the "Big Ben" class.

At the close of the century six 0-6-0 goods engines, with inside cylinders 18½ in. by 26 in. and 5 ft. wheels, in all respects of the Drummond type, were put into service, and were supplied with the well-known water tube fireboxes, which Mr. Dugald Drummond was using on the London and South Western Railway.

Finally, in 1900, Dübs & Co. built the first of the well-known "Castle" class of 4-6-0 engines for the heavy main line passenger traffic between Perth and Inverness, which the 4-4-0 engines could not tackle, except with the assistance of much piloting. These engines had 19½ in. by 26 in. cylinders, and six-coupled wheels 5 ft. 9 in. diam. They had large double bogie tenders of that unprepossessing Drummond design with inside bearings, which gave them a centipede appearance. Although the "Ben" class had Stephenson's link motion, a return was made to Allan's straight link motion in the "Castle" class. The pressure was 180 lb. Their work belongs to the 20th century, and with this mention of them I close my account of the Highland locomotives and working during the 19th century.

An Inverness reader writes that the single engine No. 32 *Cluny* was originally named *Sutherland*; No. 47 was orginally named *Bruce* before 1874, and No. 13 was originally *Lovat*. The name *Aultnakiah* of No. 50 should have been *Aultnaskiah*. The old single engine No. 13 was built by Messrs. Hawthorn (Leith), and had a four-wheeled tender. It ran for some years in the Forres district.



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American Railway Stations.

By NORMAN THOMPSON.

AS expressed by the American Railway Association, the official definition of a "station," is "a place designated on the time table by name, at which a train may stop for traffic, or to enter or leave the main track; or from which fixed signals are displayed," and a very brief experience of conditions in the western hemisphere will suffice to impress one from the "Old Country" with the essential departure that is made from the British use of the term.

In America all ticket collecting takes place on the trains, and the stations are in most cases unenclosed, and unprovided with raised platforms, footbridges or subways. The building may stand in the public thoroughfare, with the tracks laid on the street, or there may be no structure whatever, merely a stopping place recognised by local custom, with perhaps a shop as waiting room.

One recollects seeing an important train arriving at Hamilton, Ontario, sometimes called the Birmingham of Canada. A preliminary stop occurred at the water tank before drawing up to the station, and many passengers took the opportunity to at once alight, picking their way across the tracks in the direction that happened to be most convenient to each one.

The station staff is often extremely limited, the general practice being to carry a train crew large enough to handle the work rather than to attempt the maintenance of an adequate staff at each point. Frequently the "station agent" is the sole local representative of the railway, and combines the functions of booking clerk, telegraph operator and general utility man. At large stations one or more assistants

ATCHISON, TOPEKA AND SANTA FÉ RAILWAY.

Stockton Station, California, U.S.A.

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CANADIAN PACIFIC RAILWAY.

Depôt at Vancouver, B.C.

are provided, and in cases where the telegraph is in continuous use for train working a night operator relieves the agent at the close of the day shift. Porters are only to be found at large terminals in the big cities.

Many names shown on the time-tables, however, refer to places where there is no one in charge, and the passenger must look after himself and luggage as best he may, after the train has steamed away leaving him, perchance, a solitary figure surveying little else but vistas of magnificent scenery, or a desolate-looking stretch of prairie. Sometimes a name board is thoughtfully provided, supported on short posts stuck in the ground, to radiate an atmosphere of civilisation.

The word "Depôt" is in general use to denote a station where a building does exist; and a "Joint Station" is known as a "Union Depôt." These latter structures are often quite palatial, but lack the railway "atmosphere" in being cut off by gates from the platforms, which are frequently located at a different level, and either almost or altogether out of sight from the public circulating area.

The train shed, indeed, appears to be regarded as a necessary appendage to a station building, which merits little consideration as to appearance; passengers do not, of course, remain on the platforms except for a few minutes whilst actually entering or leaving the cars. The extremely low head room is a striking feature of the American train shed in its most approved modern form.

A custom that has been criticised is that of announcing the impending train departures and destinations in the general waiting-room or concourse by means of a megaphone, or even with the unaided vocal efforts of an official. The sound is frequently lost owing to the unsuitable acoustic properties of the huge dome-crowned space, and the painstaking peroration, specifying the track number from which each train will leave, consequently fails largely in accomplishing its purpose, but does succeed in keeping one on the rack, attempting to catch the name of one's station.

When addressed to a crowd of immigrants or excursionists, the remarks of the "Announcer" may be of a somewhat

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unexpected character, such as: "First class on track 4, second class on track 5, and if you get in the wrong cars, don't blame us"; or "Beach excursion, plenty of room for everyone, don't push." Cries of "Speech! speech!" sometimes greet his appearance at holiday times.

Architecture is frequently quite pleasing in American stations, and an attempt is often made to conform the style of building to its environment. The awakening of the spirit of city-planning has drawn special attention to the railway station, which it is suggested should endeavour to express something of the dignity and pride of the community to which it forms the gateway.

An open space between the building and the street has much to recommend it, and instances of gardens or lawns abutting on the "depôt" are numerous. In California such gardens may almost hide the structure from view with their profusion of growth, whilst on the prairies a flat stretch of grass, bordered by a few shrubs and flowers, represents the best that can be achieved.

A unique example of station architecture is that of Cooperstown, on the Delaware and Hudson Railroad, in the state of New York. It is built of rough stone slabs placed "herring-bone" fashion in order to suggest the period of 1800, and the waiting-room contains a fireplace and other furnishings in accord with the ways and customs of that time. The name is associated with the celebrated author, Fennimore Cooper.

Stations having platforms meeting on the same level at right angles are not uncommon in cases where the tracks make intersection at grade; a particularly neat specimen of a building in such situation is found in Illinois, at Joliet. Here the street makes an acute angle in addition, so that the general plan is somewhat complicated. There are also instances of stations built in salt water, as at Oakland (California), where several of the important main line passenger terminals are located out in San Francisco Bay, about a mile from the shore.

CANADIAN NATIONAL RAILWAYS.

Typical Station in Canadian Rockies.

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As regards large city stations, that of the Chicago and North Western Railway in Chicago has been styled "A World-admired Terminal," and it is claimed that it affords expression as an impressive portal both to whatever of allurement lies in the Golden West, and also to the beauty left behind in the Old World. The main waiting-room is described as a great Roman atrium, and its ceiling is decorated with representations of engine wheels, bells, headlights, etc. Entrances and exits have been provided in generous profusion, and a completely equipped post office, a baby's brass bed and a trained nurse are some of the unusual facilities to be found beneath the roof of this remarkable station.

It is not at all common to find a hotel disguising the front of a large passenger station, as occurs so frequently in Great Britain, but more often the general offices of the railway are combined with the depôt structure. The Canadian Pacific Railway exhibits examples of each class in its two Montreal terminals, the Windsor and Place Viger stations.

In Washington, D.C., the Union Station was constructed to conform to the æsthetic requirements of its site in close proximity to the National Capitol. White granite was the material used for the entire building, and of the 33 tracks, 20 are terminal, at the ground level, the remainder being at a lower level, of which 9 are for through traffic. The general waiting-room is modelled after the Baths of Diocletian.

For the Grand Central Terminal in New York, used by the New York Central Lines and also by the New York, New Haven and Hartford Railroad, it is claimed that it is "The most wonderful terminal in the World." Here again are to be found many unusual features both in regard to traffic working and incidentals.

The rival structure in New York of the Pennsylvania Railroad modestly claims to be the largest of its kind in the world; the architecture is Roman Doric. A visitor once appositely remarked: "Is this a railway station or a giant mausoleum to its chief instigator, whose statue occupies a prominent location at the head of the grand stairway?"

It is noteworthy that the platforms are raised in this station above the rail level, although both they and the tracks are entirely submerged and invisible from the station building.

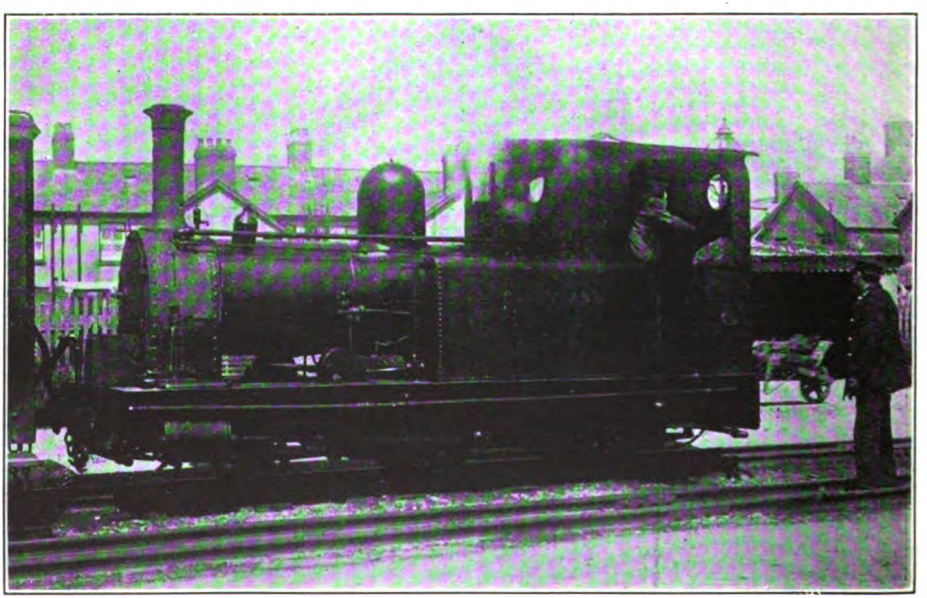

Photo.] VALE OF RHEIDOL LINE (CAMBRIAN RAILWAYS). [*H. I. Hopwood.*

2-4-0 locomotive No. 3.

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British Locomotive Practice and Performance.

By CECIL J. ALLEN,
A.M.Inst. T., A.I.Loco.E.

Photo.] [*E. A. Gurney-Smith.*

SOUTH EASTERN & CHATHAM RAILWAY.

First part of 11 a.m. Continental Boat Express passing Bickley. Rebuilt Belpaire 4-4-0 locomotive, No. 160.

TO the keen railway enthusiast July, 1921, will probably seem the most momentous, in the matter of post-war time-table re-construction, of all the months that have elapsed since the Armistice. Delayed by the coal dispute, the extensive accelerations announced in these pages to date from May 1 were brought into operation, in most cases, on July 11; on analysis, when allowance is made for extra stops—in view of the apparently permanent abandonment of many of the spectacular, but extravagant, long non-stop runs of pre-war days—they appear to entail locomotive work but little inferior on the average to that of July, 1914. In the case of some individual bookings—and, indeed, of certain complete services—the timings are distinctly harder than they were before the war.

In connection with the most important quickenings of service—the competitive routes to the North of England—I have been interested to note that I wrote in these columns as far back as December, 1919: "On the basis of present-day running on the Great Western Railway and Great Central Railway, and even such lines as the Great Eastern and South Eastern and Chatham Railways, Manchester, Liverpool and Leeds should not be more than 4 hours distant from London by the best express trains; Sheffield should be within 3 hours, 20 min. at most, and Birmingham within 2¼ hours. Nine hours between Euston and Glasgow would also appear an ample allowance." With the exception of Sheffield, between which city and London the best time is 3 hours 22 min. by Great Central and 5 min. longer by Midland route, the times cited now at last become the standard times for all the chief expresses, and in the case of Glasgow there is a still further improvement in that the 10 a.m. West Coast day train from Euston completes the journey in 8½ hours, or 15 min. only in excess of its pre-war allowance. The London-Edinburgh East Coast time likewise comes down to the excellent figure of 8½ hours in each direction, the afternoon trains, with their additional stops, being only allowed 5 min. extra for this purpose. This is really substantial progress; and it would be unwise to expect further substantial "cuts" in schedules for some time to come.

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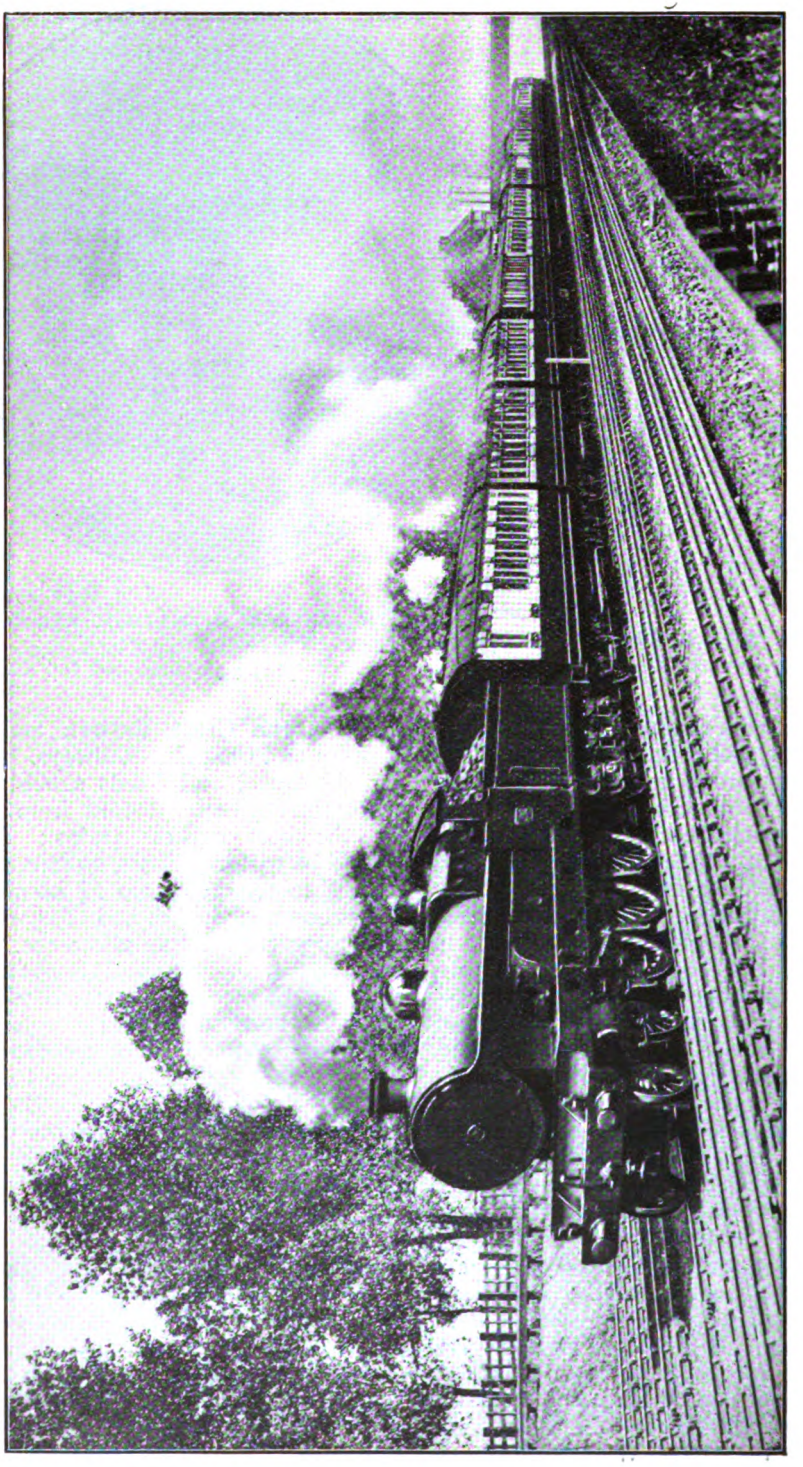

Photo.] [*F. E. Mackay.*

LONDON & NORTH WESTERN RAILWAY.

Down Manchester and Liverpool Express passing Kenton. 4-6-0 "Claughton" class locomotive No. 1103.

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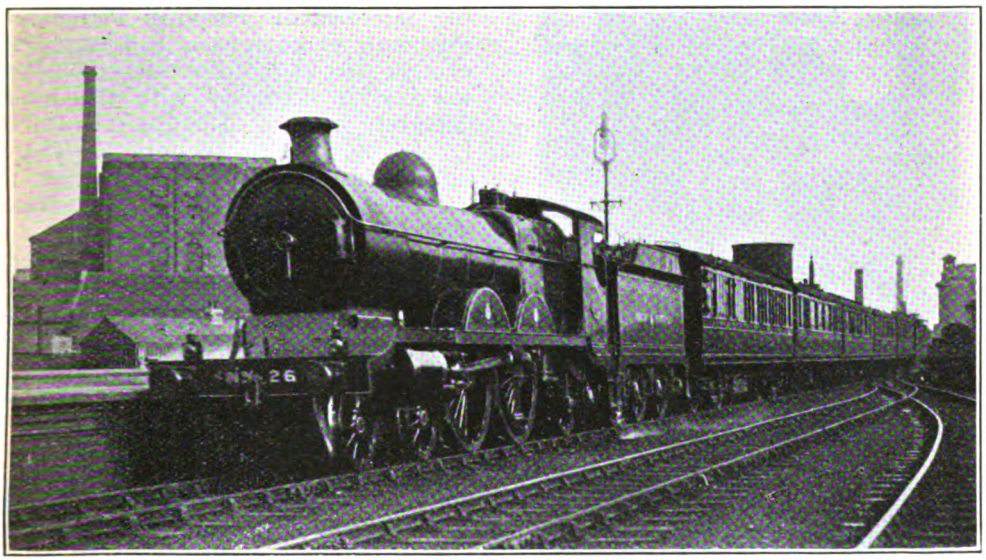
As regards the new time-tables, the altered and additional train times were dealt with in a comprehensive way in the last month's article entitled "Summer Train Services, 1921," and "Voyageur" will contribute to the October issue his annual detailed analysis of times and speeds. All that now remains for me to do, therefore, is to make a few brief observations as to the effect of the new times on the locomotive performance. In the first place, as I have often reminded readers recently, the governing factor in present-day locomotive running is the very inferior character of most of the coal available, and arrears of locomotive maintenance, on some lines in particular, have still to be overtaken. In view of such difficulties, drivers will sometimes be hard put to it to maintain the new schedules, and before the amateur recorder of running passes too severe a condemnation on the crew who have not succeeded in keeping time on his "holiday" express, it is well that he should give these salient facts careful consideration.

The most revolutionary of all the summer programmes is probably that of the London and South Western Railway, of whose new bookings I hope to make extensive trial in the near future. As this railway had undertaken less post-war train acceleration, up to the present time, than any other leading British company whose war decelerations had been correspondingly serious, the new cut in train times seems all the more drastic. The restriction on maximum speeds to 60 m.p.h. is, of course, withdrawn, as is very necessary, indeed, seeing that the time allowance for all the crack non-stopping expresses is only 22 min. for the 23·5 miles from Basingstoke to Woking, and 20 min. for the 20·5 miles thence to Clapham Junction. This schedule of 42 min. for 44 miles' run is all but the fastest now operating in the British Isles; it applies in the case of no fewer than 10 trains in all. The new time of 2¼ hours by the best expresses from Waterloo to Bournemouth, after a stop of 7 min. at Southampton West has been deducted (worth at least 9 min. in actual running), leaves an equivalent non-stop time of 126 min. between Waterloo and Bournemouth Central, or 6 min. only more than the exceedingly difficult 2-hour timings of pre-war days. Further, the new 9-coach corridor sets, including "diner," working on the chief trains, are appreciably heavier than the old non-corridor formations which ran on the 2-hour trains before the war.



GREAT CENTRAL RAILWAY.

Marylebone–Sheffield express at Leicester. 4-4-2 locomotive, No. 260.

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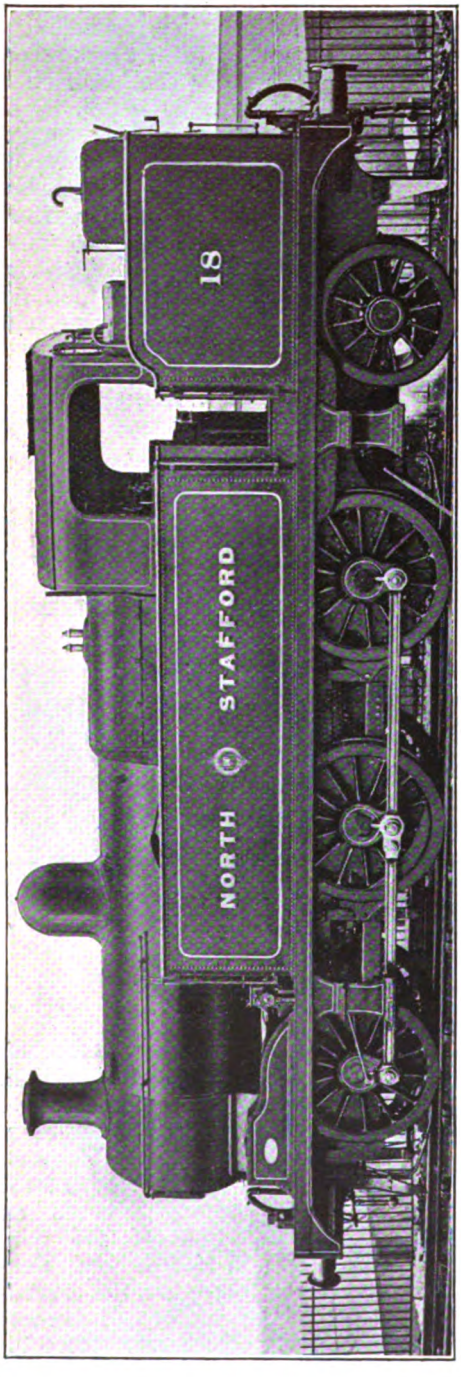

NORTH STAFFORDSHIRE RAILWAY 0-6-2 TYPE TANK ENGINE, FITTED WITH OIL-BURNING APPARATUS.

Average locomotive work on the Bournemouth route will therefore be distinctly harder than that of pre-war days.

On the West of England main line, a standard time of 95 min. each way between Waterloo and Salisbury is 4 min. worse than the best and 1 min. worse than the average pre-war down time, and 3 min. behind the general time of 92 min. for up expresses, while a non-stop time of 104 min. each way between Salisbury and Exeter represents a slowing of 8 min. down and 6 min. up. The spreading out of that profuse 11 o'clock "bunch" of down West of England expresses into departures at 10 and 11 a.m., and 12 noon, for different destinations, with the intermediate relieving Portsmouth-Plymouth express from Salisbury, is a notable step in the direction of punctual working, in harmony with the hourly departure scheme. The Chairman of the London and South Western Railway is indeed justified in claiming that the summer service of his line is an advance on that of pre-war years. Certainly it is, and the South Western management deserves congratulation on enterprise of this character in such lean days as these.

It is difficult to "place" the programmes of other companies in their correct order of merit, but that of the Great Northern Railway is certainly very near the top. As a striking example of the calibre of the new times, it may be pointed out that, whereas in 1914 the six best expresses from Peterborough to London took respectively 81, 86, 86, 88, 89, and 90 min. on their journeys, four trains now in 85 min. and two in 86 min., give an average better by over 1 min. in favour of the present service. As regards certain individual trains, the 5.30 p.m. from Leeds to London is only 5 min. worse than pre-war, with an extra 5 min. stop at Peterborough; the 2.55 p.m. up (now 3.30) is actually 5 min. *better* despite an additional stop at Retford; the 7.15 a.m. down is restored practically to its identical pre-war timing to Leeds; and the 5.45 p.m. (now 5.40) has only 10 min. added on to 1914 times, of which an additional stop at Grantham consumes 5 min. and is worth fully 8 min. Of the Scottish trains, the afternoon expresses have the most notable timings; the 1.20 p.m. (pre-war 2.20) down has 3 min. more than the old

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122 min. to Grantham, and runs thence to York in practically the pre-war time, as 99 min. through to Clifton Junction is fully equal to the old 97 min. to York Station. The shorter stop at York and acceleration thereafter brings this train into Darlington in 3 min. *under* pre-war time from London.

Similarly the up express is expedited 8 min. over pre-war times between York and London, the stops at Doncaster and Peterborough being omitted; it makes the fastest run of the day from Grantham to London, in 122 min. Curiously enough, it is the Newcastle trains that have been neglected in the improvements; the 5.30 p.m. down is accelerated to a 121 min. run to Grantham, but loses this advantage in view of a 102 min. run on to Clifton Junction at York—3 min. more than the 1.20 p.m. down, despite passing Doncaster in 2 min. less, *i.e.*, 56 min. And the corresponding up express (8 a.m. from Newcastle) continues to perform that painful journey behind the 9.55 a.m. up Leeds, arriving still within 5 min. of its worst wartime figure of 2.15 p.m. And as for the so-called Newcastle "express" which reaches London at 5 p.m., how exactly it manages to spin out 4 hours 40 min. between York and London, with stops only at Doncaster and Selby (despite its pre-war reputation at a time-loser) is more than I can fathom! Surely an arrival at 4.30 p.m. could be effected without the remotest difficulty.

Extensive time-cuts on the London and North Western Railway do not bring the locomotive work quite so near pre-war level as they have done on the Great Northern Railway, but the difference is really slight. For example, the morning expresses from Euston to Liverpool and Manchester at 10.25 and 11.50 a.m. from Euston—the former, with through coaches in addition for both Southport and Colne, being now made up to over its average pre-war weight—being allowed the standard non-stop timing of 181 min. to Crewe, in place of the pre-war 171 and 175 min. respectively. This timing of 181 min. (why, I wonder, the odd minute?) is made up in the proportion of 95 min. to Rugby, and 86 min. thence to Crewe, which figures, with slight variations arising out of traffic conditions, apply to all the chief expresses in both directions. In the opposite direction the most noteworthy schedule is that of the 12.5 noon express from Manchester to London, which is once again non-stop from Stoke to Willesden. For this run of 140½ miles the allowance is 157 min., as against 148 min. in 1914.

On the West Coast route again the restoration of the day Scotch expresses

Photo.] CALEDONIAN RAILWAY. [*F. E. Mackay.*

Euston–Perth Express. 4-4-0 locomotives Nos. 928 (Pickersgill type, superheated) and 890.

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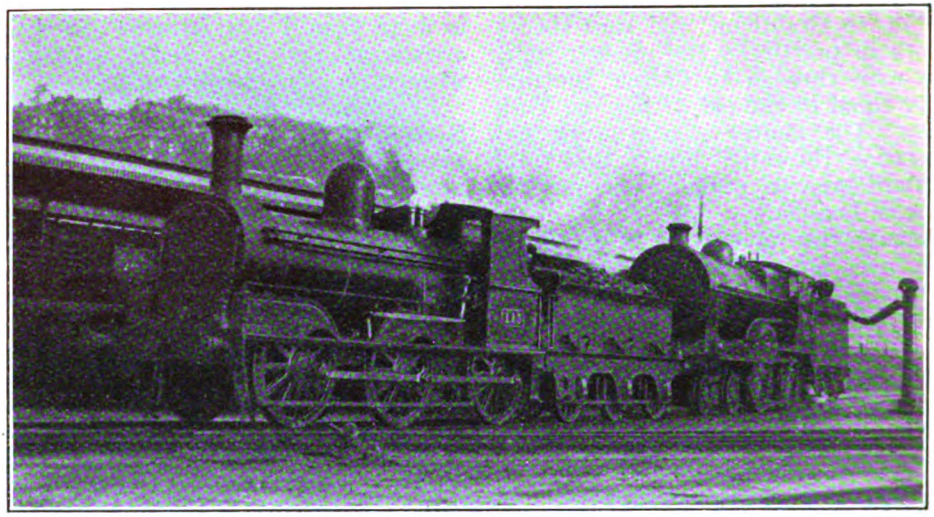

Photo.] **GREAT SOUTHERN AND WESTERN RAILWAY.** *[R. Murphy.*

Locomotives No. 341, "Sir William Goulding," and No. 113 (pilot) at Cork, prior to being attached to express to Dublin.

is all but complete; the 10 a.m. down, without being divided at Crewe, as before the war, but yet carrying Edinburgh, Glasgow and Aberdeen portions, is booked into Carlisle at 4.3 instead of 3.51 p.m.—a trifling increase of 12 min. over a distance of 299 miles—while the 1.30 p.m. takes only 2 min. more than the old 2 p.m. down to the same point. In both cases the only stop now omitted is Willesden, the Lancaster stop in the case of the afternoon train balancing the previous stop at Preston. Of the up "Scotsmen," the afternoon train makes the better running, taking only 12 min. more than the pre-war time from Carlisle to Euston; this again is with the full load from Carlisle to Preston, and with the same number of stops, one at Nuneaton now replacing the old one at Willesden. From Rugby a very fast run is made to Euston in 93 min., only two trains throughout the day being thus booked in less than 95 min. This preferential treatment of Scotch expresses makes one wonder if the withdrawal of Government control is likely to lead to a renewal of contests in speed between the East and West Coast routes. One hesitates, of course, to mention such a thing as a "race," but already there are rumours abroad!

Strictly speaking, the Great Western summer time-table should by no means be classed after those of the Great Northern and North Western in order of merit, seeing that the times already in force approximated so closely to these obtaining prior to the war; the further accelerations, however, are confined to certain services only. Prominent among these is the cut in the Bristol times. The 11.15 a.m. down covers the 118·3 miles non-stop *via* Bath in 128 min., and the 1 p.m., diverted to the same route, and running in the same point-to-point schedule, reaches Bath, 106·9 miles, in 113 min., average 56·8 m.p.h. Better still, the two up non-stops, at 12 noon and 5 p.m., cover the 117·6 miles to Paddington, *via* Badminton, in 5 min. only over the pre-war 2 hour timing; in the latter case, in addition to the severe ascent to Filton, and the slacks there and at Wootton Bassett, this 56·4 m.p.h. schedule includes a bad slack through Reading for the purpose of slipping a coach in the loop line platform. The booking of 87 min. by these trains for the 90·9 miles from Badminton to Southall is probably for its length the fastest in the world at the present time. I should certainly like to hear of anything more speedy. Of this distance the 17 miles from Badminton to Wootton Bassett are timed to be covered by the afternoon train in 13 min., at an *average* speed of 78·5 m.p.h.! The fastest start-to-stop

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schedule on the Great Western Railway is made by the 9.10 a.m. from Paddington to the North, which is scheduled to make the 41 miles from High Wycombe to Banbury in 43 min., at an average of 57.2 m.p.h.—very nearly the fastest booking in the British Isles. This is the only train to observe the 2¼ hours' timing to Birmingham with three intermediate stops (the actual allowance for standing at stations is 8 min.); with one or two stops only, a timing 15 min. over that of the pre-war era still leaves an appreciable diminution in the merit of locomotive achievement.

The Caledonian time-table is one which has been making gradual but constant progress back towards high speeds, and amongst its schedules some fine feats may be noticed. They include the fastest run in the United Kingdom—Forfar to Perth, 32·5 miles, in 34 min., at 57·4 m.p.h.—and other runs over the same course, in both directions, in 35, 36, 37, and two in 39 min. (the last-mentioned are *fish* trains!). In the same neighbourhood the 16·7 miles between Coupar Angus and Forfar are run both ways in 19 min., and the 12 miles from Alyth Junction to Forfar in 14 min.; these runs are all start-to-stop, and over a practically level line. The down "Postal" is accelerated to a run of 105 min. over the 89·8 miles from Perth to Aberdeen (passing Forfar in 36 min.). In the opposite direction the corresponding train distinguishes itself by making the fastest run of the day over the 66·9 miles from Symington to Carlisle in 77 min., at an average of 52·2 m.p.h. A striking feature of the schedules on the southern section is that the Glasgow portion of the 10.0 a.m. ex-Euston is the only north-bound express not booked to call at Beattock for assistance; it is scheduled to pass Summit, 49·7 miles, and to reach Symington, where a conditional stop is scheduled, in 86 min.

On the Midland Railway the actual curtailments of running times from those of the time-table immediately preceding have not been great; for example, London-Leicester drops from 120 to 119 min., Leicester-London from 118 to 115 min., London-Nottingham from 145 to 144 min., Hellifield-Carlisle from 90 to 89 min., and so on. A further batch of trains, however, has been selected for expedition to the new standard times, to

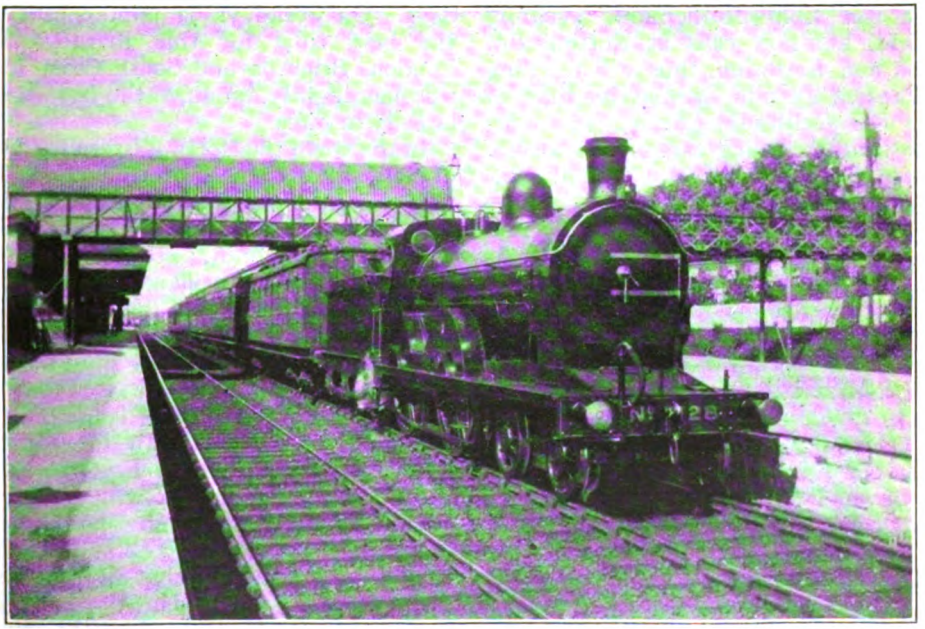

Photo.] **GREAT NORTHERN RAILWAY (IRELAND).** [*H. A. E. Smart.*

Londonderry to Belfast train at Lisburn Station.

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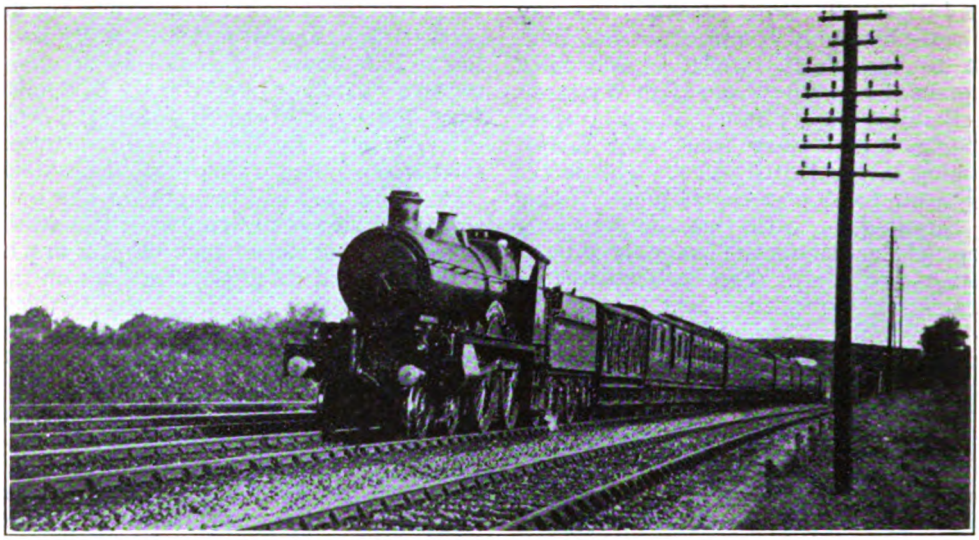

GREAT WESTERN RAILWAY.

North express passing Knowle. 4-4-0 locomotive, No. 3814, "County of Cheshire."

which practically the whole of the express trains on the line now conform. Among trains specially speeded up may be mentioned the 12.15 p.m. down Manchester and the 1 p.m. up Leeds, both of which are "cut" by ¾-hour; the latter resumes its direct run from Rotherham, avoiding Sheffield, but now calls at Nottingham, Melton and Kettering, thus still reaching St. Pancras 45 min. behind its time of 1914. Of novelties the principal, of course, is the through dining car express service between St. Pancras and Bradford (Exchange) *via* Thornhill and the Lancashire and Yorkshire line—a revival of the 1.50 p.m. "Yorkshire Express" of pre-war summers. The latter, however, was really a relief of the 1.30 p.m. down "Scotsman," and ran *via* Leicester, whereas the new train, at 1.20 p.m., takes the Nottingham route, and makes a non-stop run to that town in 144 min.

A splendid summer service is in force on the South Eastern and Chatham Railway, of which the chief asset is a reduction of the fastest time between Charing Cross and Folkestone to 85 min.—1 min. less would bring this journey within the select pale of 50 m.p.h. runs—by two trains in each direction. Fine running is also made by the Folkestone portion of the 5.10 p.m. *ex*-Cannon Street, which, although admittedly it is only a three-coach set, is booked from Tonbridge to Folkestone Central, 40½ miles, in 44 min., start-to-stop, at an average of 55·2 m.p.h. Between Victoria and Margate the 90 min. non-stop timing reappears in the case of the "Pullman Limited" in each direction on Sundays. On weekdays 92 min. constitutes the best time for this journey. The London, Brighton and South Coast Railway has slightly amplified the fast service already in force.

In the north the North Eastern has little of note other than the introduction of a new non-stop express from Edinburgh to Newcastle at 2.10 in the afternoon taking a time of 151 min.; this follows the up afternoon "Scotsman," making certain connections which the latter made before the war but cannot now do in view of its earlier start, and conveying through coaches from Perth to York. From the speed point of view there is nothing to remark in connection with the summer time-tables of the Great Eastern, Great Central and Lancashire and Yorkshire Railways, as they embody no advance on the standards already obtaining. But it must be remembered that all these three railways maintained point-to-point running speeds closely approaching the normal throughout the war period. An interesting revival, as concerns the two first-mentioned of these railways, is that of the

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restaurant car boat express between Liverpool and Harwich, composed on alternate days of Great Central and Great Eastern stock; through coaches are also run between Harwich and Birmingham (London and North Western), but the York portion is not reinstated, a through portion to and from Peterborough (Great Northern) making good connections with the North of England *via* the Great Northern main line.

Long ere this I had hoped to conclude my remarks concerning the summer train services, but the subject is so vast that it would take many instalments of this article, rather than a corner of one, to deal with it in any degree adequately. I have still room, however, to complete my survey of the locomotive work performed on the Great Northern Railway with colossal loads during the recent coal strike period. In the August RAILWAY MAGAZINE, I showed in tabular form a long series of experiences on the down journey with trains varying in weight from 415 to 575 tons; now I wish to deal with one or two in the up direction of running. There is no need to recapitulate the gradients, as I gave these in great detail last month, and the description was supplemented by a profile which appeared under the frontispiece plate in the same number.

First of all, let me describe the work of three-cylinder 2-6-0 No. 1001 on the first portion of that "omnibus" express arriving in London at 2.23 p.m. The traffic officials had evidently made a special concession on this occasion in allowing the Leeds section to run separately in advance, but the arrangement was certainly necessary, seeing that this relief alone loaded to 63 axles; the latter was packed, and weighed full 440 tons, but being partly of non-corridor formation, the tare weight was only 398 tons. An amazing start was made out of Peterborough, Yaxley, 3·8 miles, being passed in 6 min. 10 sec. (the first 2 miles are mostly on rising grades), Holme, 7 miles, in 9 min.; Abbot's Ripton, 12·9 miles, in 15 min. 25 sec.; and Leys Box, 14·4 miles, in 17¼ min.—by far the fastest exit from Peterborough with such a load that I have ever recorded. On the level stretch at Holme we were doing 64½ m.p.h., and the lowest speed up 4½ miles at 1 in 200 was 48 m.p.h.; at the conclusion of this bank our steed was blowing off furiously! After this the engine was very clearly "eased," and we did not touch 60 on the succeeding descent, the time to Huntingdon, 17·5 miles (booked 23 min.), being 20 min. 40 sec., and to St. Neot's, 24·7 miles, 28½ min. Then we "got going" again, touching 62½ m.p.h. beyond St.

Photo.] LONDON, BRIGHTON & SOUTH COAST RAILWAY. [*C. J. Housego.*

Up Portsmouth train running through Epsom (London & South Western Station).
4-4-0 locomotive, No. 62.

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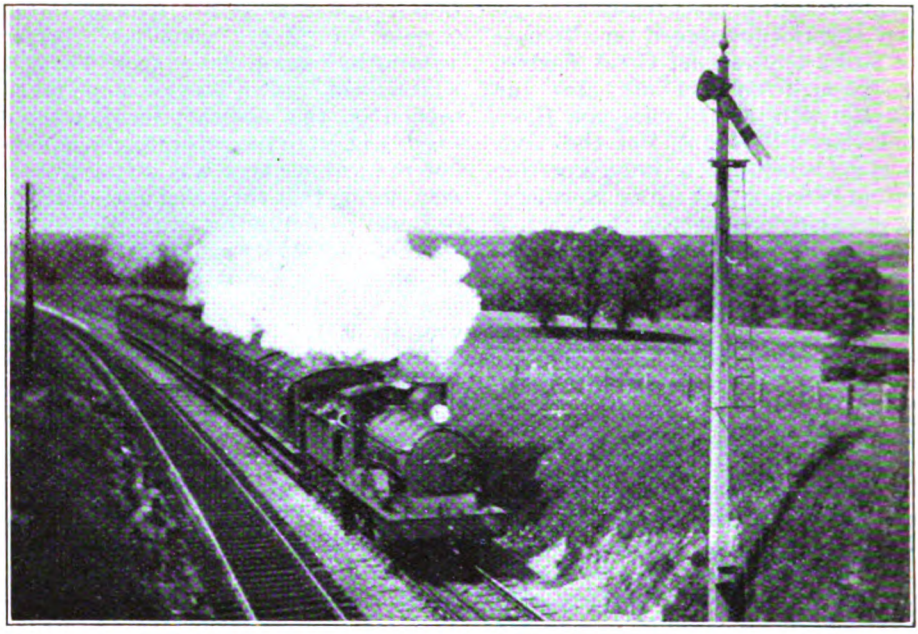

Photo.] GREAT EASTERN RAILWAY. [*G. H. Cannon.*

Cambridge to Liverpool Street slow train between Great Chesterford and Audley End.

Neot's, and running at something between that speed and 54 m.p.h. all the way to Three Counties. So Sandy, 32·3 miles, was passed in 36 min. 10 sec., Arlesey, 39·4 miles, in 43½ min., and Hitchin, 44·5 miles, in 49 min. 35 sec.

The 6 miles' ascent, mostly at 1 in 200, from Three Counties to Stevenage, troubled us comparatively little, as on it we fell merely from 58½ to 39 m.p.h., and probably would have done better even than this, had not the driver refrained from "opening out" the engine until we were passing Hitchin, more than half-way up the ascent. By then we had already fallen to 41 m.p.h., but thereafter accelerated slightly for a short distance. Stevenage, 47·8 miles, was passed in 54 min. 40 sec.; Woolmer Green, 52·9 miles, in 61 min. 20 sec.; Hatfield, 58·7 miles, in 67 min. 5 sec., at 65 m.p.h.; and Potter's Bar, 63·7 miles, in 72¾ min., at 50½ m.p.h. After this, the conclusion of the run was quite spoiled in that we were stopped at Hadley Wood, and turned thence to slow road as far as the other side of New Barnet, apparently in order that painters working on the station awnings at New Barnet should not have to move their ladders for the few moments necessary to allow us to pass. Thus some 600 passengers lost some 7 min. apiece—a total time-loss of 70 hours—from this somewhat indefensible cause. Our total time for the 76·4 miles from Peterborough to King's Cross, against a booking of 93 min., was 94 min. 35 sec., but our net time was the excellent one of 87½ min., and this might easily have been cut to the new "crack" time of 85 min., had the engine not been so markedly eased at two points at least. Mr. Gresley's fine locomotive never appeared to be short of steam at any time, and running of this character is an excellent measure of the remarkable tractive possibilities of the new type.

At the same time, the work that the "Atlantics" can do when put to it is nothing short of astounding. On the first day that the 9.35 a.m. up Leeds ran in combination with the 8 a.m. from Newcastle, I was fortunate enough to be a passenger by the latter. From Darlington as far as Doncaster we had already done quite well, North Eastern three-cylinder "Atlantic" No. 2208 having run to Northallerton, 14·1 miles, in 19 min., start-to-stop, and from there to York,

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30 miles, in 34 min. 10 sec., touching 64½ m.p.h., and passing Skelton Bridge, 26·9 miles, in 29 min. 25 sec.; after that small superheated Great Northern 4-4-2 No. 950 came on, and with 305 tons made quite a good run on to Doncaster in a net time of 40 min. At Doncaster the load was made up to 14 eight-wheelers, practically all of them of the heaviest stock, and three twelve wheelers, of which two were "diners," and one a modern Gresley twin-coach; the tare weight of this vast assemblage totalled 526 tons, and as the number of passengers was in the neighbourhood of 800, and in addition to their luggage in the compartments, every brake van and locker was piled with heavy luggage literally to the roof (passage from the back of the train to the dining cars was an absolute impossibility), the gross load behind the tender of superheated "Atlantic" No. 295 was, as nearly as I could calculate, exactly 600 tons.

Needless to say, a four-coupled engine, with only 36 tons adhesion weight, is not likely to start so briskly from rest as a six-coupled, with 60 tons of adhesion and driving wheels of a foot less diameter; consequently our small losses of time were confined to the short run from Doncaster to Retford—17·4 miles, allowed only 22 min. start-to-stop—and the Grantham Peterborough length, with its formidable climb from the start to Stoke. On the first easy 3½ miles from Doncaster we attained 47½ m.p.h., and went up the 2½ miles at 1 in 198 to Piper's Wood without the speed falling below 39 m.p.h.; the short descent to Scrooby troughs produced a maximum of exactly 60 m.p.h. So we passed Rossington, 4·7 miles, in 8 min. 40 sec.; Piper's Wood, 6·6 miles, in 11 min. 25 sec.; Bawtry, 8·3 miles, in 13 min. 35 sec.; Ranskill, 12·1 miles, in 17½ min., and reached Retford in 23 min. 40 sec.—a loss of 1 min. 40 sec. on schedule.

After re-starting, we had to face Askham bank, with its 3¼ adverse miles at 1 in 178–200; on this we managed to accelerate to 26 m.p.h., passing Markham Box, 4·9 miles, in 11 min. 55 sec. Tuxford, 6·7 miles, was passed in 14 min. 25 sec., and on the succeeding descent we touched 69 m.p.h., the 5·5 miles from Tuxford to Carlton taking 5 min. 20 sec., and the 6·3 level miles on to Newark, where we were still running at 60 m.p.h., 6 min.—total 25¾ min. from Retford. From Newark to Grantham the grades are entirely adverse, but the 4·7 miles to Claypole, mostly at 1 in 300–330, occupied only 4 min. 55 dec. (at Claypole we were running at 48 m.p.h.); the 5·7 miles on to Barkston, steepening from 1 in 300 to 200, 7 min.; and the last 4·2 miles into Grantham 6 min. 40 sec.—total 44 min. 20 sec. for the 33·1 miles from Retford, as against 44 min. allowed. Minimum speed up the 2 miles

Photo. GREAT NORTHERN RAILWAY. [*H. W. Chivers.*

No. 7 signal box, Finsbury Park, North London Railway train approaching.

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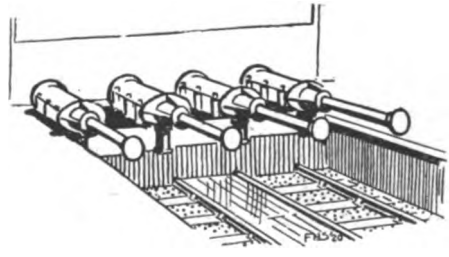
at 1 in 200 to Peascliffe Tunnel was 37½ m.p.h. From Grantham start we actually attained 30½ m.p.h. up the 5·4 miles of continuous 1 in 200 to Stoke—a really marvellous feat with 600 tons—passing that box in 13½ min.; then we ran at a fine speed down to Peterborough, reaching 72½ m.p.h. at Bytham and 75 at Essendine, and after that, on a little easier than level track, not falling below 70½ at Tallington, 67 at Helpston and 65 at Werrington. So we passed Corby, 8·4 miles, in 17¼ min.; Bytham, 13·3 miles, in 21 min. 35 sec.; Essendine, 16·9 miles, in 24½ min.; Tallington, 20·7 miles, in 27 min. 40 sec.; and Werrington, 26 miles, in 32 min. 25 sec.; reaching Peterborough, 29·1 miles, in 36 min. 5 sec., as compared with 36 min. allowed. So No. 295 had dropped in all 3 min. only on the normal schedule of a train planned to load to something not exceeding at most about 400 tons. Crowles was the driver.

Next there came on another superheated "Atlantic," No. 290, and driver Taylor was determined to lose no time at all. So we passed Yaxley in 8 min. 5 sec.; Holme in 11 min. 40 sec., at 58½ m.p.h.; Ripton in 18½ and Leys Box in 20¾ min., the lowest rate on the climb being 39 m.p.h. Descending to Huntingdon, we got up to 68 m.p.h., passing that town in 24 min. 5 sec.; falling to 55 m.p.h. on the slight ascent to St. Neot's, and regaining 62½ before Sandy, we were through the former station in 31 and the latter in 39 min. Arlesey was passed in 47 min., Hitchin in 53 min. 35 sec., and Stevenage in 59½ m.p.h., the lowest speed on the long ascent being 33 m.p.h. Onwards we passed Woolmer Green in 66 min. 35 sec.; Hatfield at 69 m.p.h., in 72 min. 25 sec.; and Potter's Bar, at 51 m.p.h. (another astonishing piece of work, this!) in 78 min. A maximum of 67 m.p.h. at Oakleigh Park was succeeded by the now usual slack through Wood Green Tunnel, but for all that we stopped dead at King's Cross in 92 min. 35 sec. from Peterborough, or 25 sec. clear *under* schedule time. Had I not timed this classic feat myself, I would never have considered it possible!

It is difficult to select the most meritorious features of such running; obviously the engines were going "all out" for practically the whole distance. I have already indicated the points which struck me the most forcibly north of Peterborough; southwards the time of 29½ miles from Huntingdon to Hitchin, over a 27-mile section almost exclusively in favour of down trains, appears the outstanding piece of performance. As mentioned elsewhere in this issue, Mr. Gresley has made public the coal consumption of his new "Moguls" on these workings; the comparative figures for the "Atlantics" would make intensely interesting reading if available. As regards the running, the "Moguls," of course, have all the advantage in starting and on the heavy grades, but the "Atlantics" show up as well and better on the long stretches run at high speed—*vide* No. 290's time from Huntingdon to Hitchin, only 35 sec. more than that of No. 1001, despite a 40 per cent. heavier train. But all these advantages should be combined in that long-promised Great Northern Railway "Pacific"!



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Metropolitan Railway and the Housing Question.

The Line of the Three E's—Energy, Enterprise and Enthusiasm.

THAT there is no need to cross the ocean for men of energy and enterprise to find an outlet for their activities has been proved more than once in recent history. Even on the very threshold of the great metropolis there is room for development and for pioneering work. Ample evidence of this was demonstrated on the occasion of a recent press tour through "Metro-land," the territory served by the Metropolitan Railway's line from Baker Street to Aylesbury.

Under the direction of Mr. W. Holt (Traffic Superintendent), Mr. John Wardle (Commercial Manager), and Mr. H. Gibson (Metropolitan Railway Country Estates, Limited), the party left Baker Street at 10 a.m. by special train hauled by one of the reconstructed electric locomotives, of the design illustrated and described on pages 110 and 111 of the August RAILWAY MAGAZINE and further illustrated by a photographic reproduction on page 190 of this issue.

At Neasden, the first stop, a demonstration was given in the working of the train stop which, in conjunction with the automatic upper-quadrant signals, comprises the safety apparatus on the electrified lines. The party then proceeded to the Kingsbury Garden Village Estate to inspect the buildings erected by the Metropolitan Railway Country Estates, Limited, in connection with their housing scheme.

An extended tour through the Neasden works followed; the party passed through the carriage shops, armature shops, and finally reached the power house, where the working of coal and oil furnaces was explained and attention drawn to the extensions in process.

The latest generating unit to be installed at Neasden power station consists of a 12,000 kw. (16,100 h.p.) turbo-alternator set, with jet condensing plant, the complete unit being constructed and installed by the Metropolitan-Vickers Electrical Company, Limited. The turbine is a Rateau impulse type machine designed to drive the alternator at a speed of 2,000 r.p.m., and to work at a steam pressure of 250 lb. per sq. in., the steam being super-heated to a temperature of 650° Fahr. It will carry an overload of 15,000 kw. (20,100 h.p.).

On leaving the power station, the party entrained at the Wembley Park end of Neasden Yard, and on arriving at Wembley Park inspected the site of the proposed British Empire Exhibition (1923), of which H.R.H. the Prince of Wales is chairman. This site occupies 120 acres of land, partly flat and partly undulating, and it possesses very attractive natural features. As it is almost free from buildings, it will be possible for the Exhibition to be laid out in the most advantageous manner. It is within easy reach of London by the Metropolitan, Great Central and London and North Western lines, and, as at present arranged, it is intended that all the buildings shall be of a permanent character and constructed at a cost of over one million pounds, so that, after the British Empire Exhibition closes, it may be used for trade fairs and as a national sports centre.

Rickmansworth was the next stop, and from this station the party was conveyed in motor coaches to visit the Cedars Estate lying between Rickmansworth and Chorley Wood, passing *en route* the Rickmansworth War Memorial. Here the Metropolitan have acquired 500 acres for the purpose of their housing scheme. Those of the assembled journalists who were competent to judge were very much impressed with the conveniently-planned

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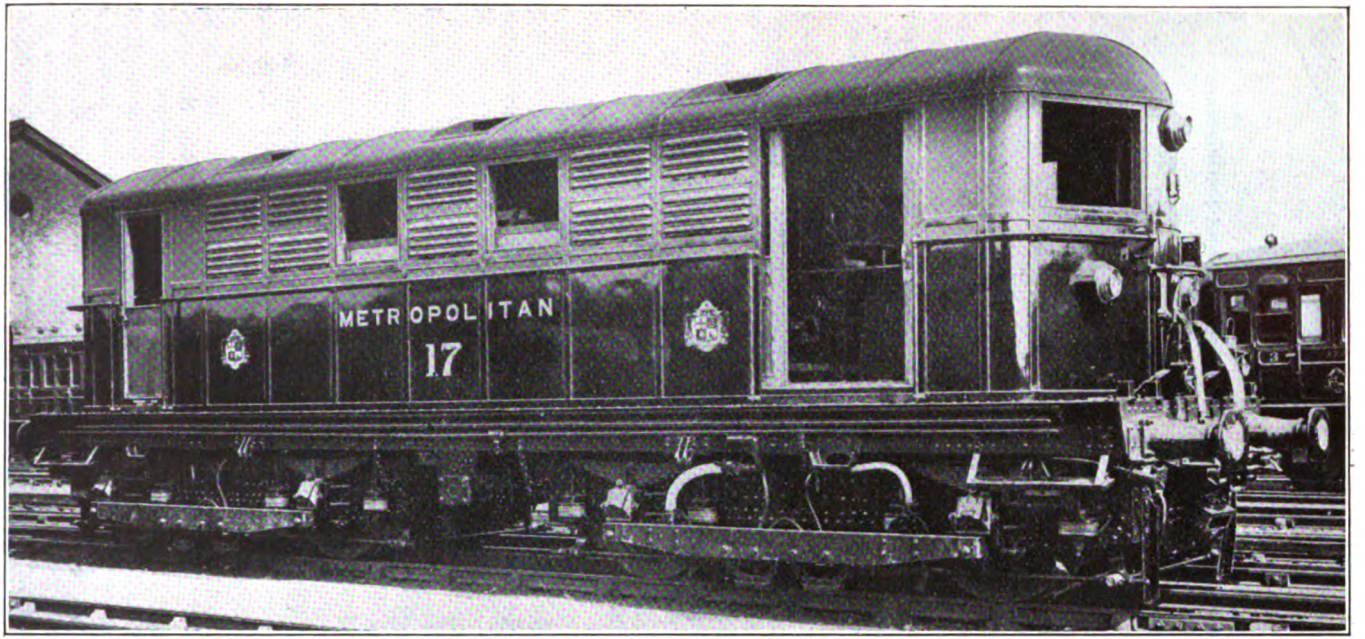

METROPOLITAN RAILWAY RE-CONSTRUCTED ELECTRIC LOCOMOTIVE, No. 17.

This locomotive is of 1,200 h.p. and is one of twenty electric locomotives employed in working non-electric rolling-stock over the electrified lines of the Metropolitan Railway. For line drawings and particulars see August RAILWAY MAGAZINE, pages 110 and 111.

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arrangements, and the manner in which the estate was being laid out.

Altogether the company are in process of developing four estates as follows :—

1. Kingsbury Garden Village, Neasden.
2. Chalk Hill Estate, Wembley Park,
3. Grange Estate, Pinner,
4. The Cedars Estate, Rickmansworth.

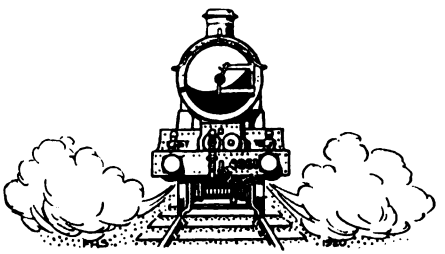
and it is claimed that, in the development of these estates, the company are providing houses to meet all tastes and all purses.

Lunch was taken at Rickmansworth, where the party was joined by Mr. R. H. Selbie, C.B.E. (General Manager, Metropolitan Railway), and Mr. G. R. Sims, the celebrated journalist, and playwright. After lunch, Mr. Sims, in fitting terms, proposed the success of the Metropolitan Railway and coupled with the toast the name of Mr. R. H. Selbie, "the genial and esteemed General Manager." Mr. Sims referred to the Metropolitan as a railway characterised by the three E's—energy, enterprise and enthusiasm.

Mr. Selbie, in replying, said that he was reminded of a conversation he heard in a railway carriage some years ago when an old man addressing a young man said, "If you want to make money, get hold of a good thing, tell the press all about it, and rake in the profits." He thought that the Metropolitan Railway, in the estates they were developing, had got hold of a really good thing, and they were now endeavouring to tell the members of the press all about it. He would add that they also had the capacity for raking in any profits that might come their way.

Continuing, Mr. Selbie remarked that the Metropolitan Railway had a direct asset in the beauty of the country which they served, and they endeavoured to make the most of this by providing safety in rolling-stock and efficiency of service between those suburbs and the city. He did not think there was any railway running out of London which provided a better service. They had gone beyond any other company in providing houses as well as train services to reach them. When the war was over they found themselves, in the face of having to carry 50 per cent. more passengers daily than in 1913 with the same amount of rolling-stock and power. To meet this situation they gave orders, exceeding one millions pounds, for new rolling-stock and locomotives. Their new locomotives would be 50 per cent. stronger than the existing ones. In addition they were considerably extending their electric installation at Neasden. Further, Mr. Selbie said that his company were the pioneers in underground railways, in electrification, and in railway estate development. His opinion of a good train service was one not just sufficient to meet present needs, but to be just ahead of them, and only in that way could traffic be properly developed.

After luncheon the party travelled to Wendover, then returning to town, arrived at Baker Street shortly after 4 p.m. All who participated in the trip were greatly impressed by the excellent arrangements made by Mr. John Wardle, Commercial Manager. Mr. Wardle's organising abilities are well-known and recognised in railway circles and he has the advantage of being served by a loyal and capable staff.



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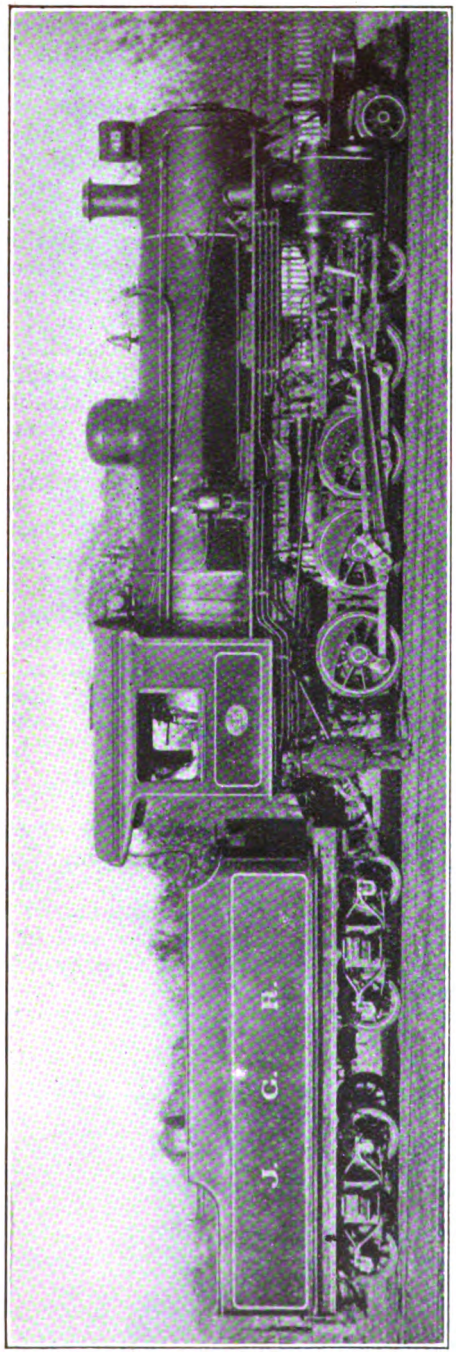

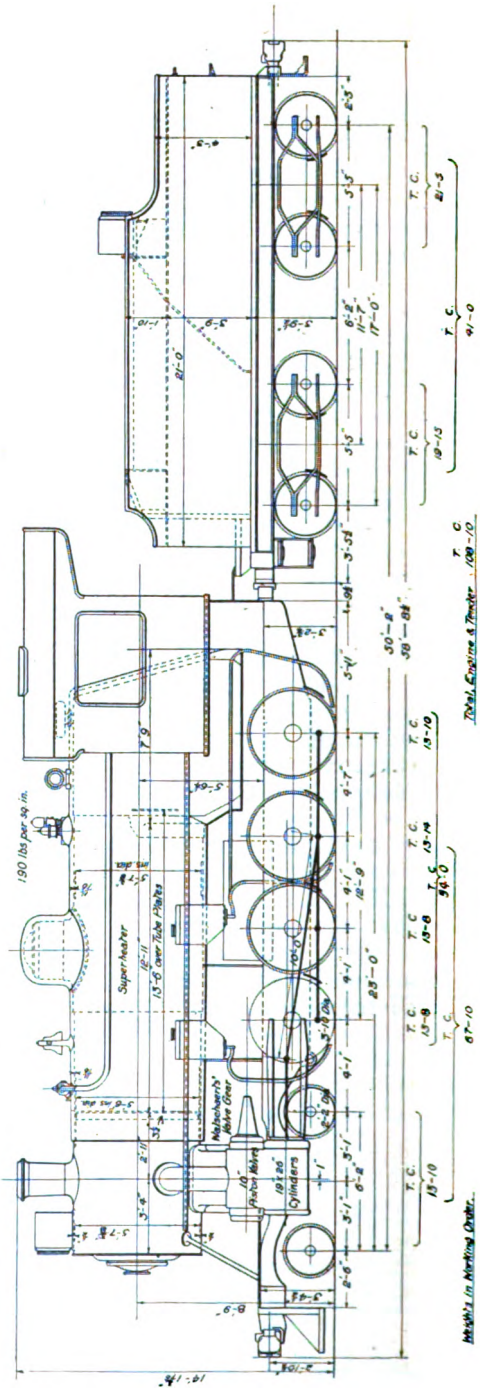

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New 4-8-0 Locomotives for the Jamaica Government Railways.

WE are indebted to Mr. P. C. Dewhurst, Locomotive Carriage and Wagon Superintendent of the Jamaica Government Railways, for photograph, a drawing and particulars of some new 4-8-0 type locomotives, recently constructed by the Canadian Locomotive Company to his requirements and general particulars of design, the engines being built on the American system with bar framing, &c.

The design embodies several interesting features introduced by Mr. Dewhurst to enable engines of such comparatively large size to operate successfully round 3·6 chain curves.

Full advantage has been taken of the rather liberal loading gauge of the Jamaica Government Railways, which is 14 ft. 3 in. in height and 10 ft. 3 in. in width, and the engines develop a rated tractive force at 85 per cent. of boiler pressure of 32,953 lb., together with satisfactory boiler and other ratios, although the axle loads are limited to 13¾ tons. They probably mark the extreme limit that can be attained in the direction of high capacity locomotives of a non-articulated type for the limiting conditions of curvature and axle load given.

These engines work all classes of traffic on the hill sections of the main line, which abound in reverse curves between 4 and 5 chains radius, and include a number of stretches of 6 to 7 miles of 1 in 30 gradient, combined with these curves uncompensated; and are giving very satisfactory service. Soft coal is the fuel used, although it is intended to equip some of the engines to burn oil fuel. The special flexibility of the engine is obtained by the following features.

The bogie is of the swing-link type with three-point suspension hangers having considerable lateral resistance to enable the whole duty of curving the engine to be performed by the bogie alone. The front pair of coupled wheels are flangeless for the same reason and are provided with a tread 6½ in. wide to allow for the relative change of position of the rails when traversing curves. The intermediate and main driving wheels have normal flanged tyres, as also the rear coupled wheels, but these wheels have ⅝ in. lateral movement to bring the main driving wheel flanges into operation in addition to the rear ones when the engines are running backwards. This feature also reduces the actual rigid wheelbase to 4 ft. 1 in., and as a result, the engines negotiate curves very similarly to an articulated locomotive. Flange wear on the bogie is found to be remarkably small considering the abnormal amount of curving work the engines have to do, and the other flanges wear no more than on engines in normal service. The flanges of the intermediate coupled wheels, the first axle of the two forming the rigid wheelbase, do not come in contact with the rails on the sharp curves, together with the remarkably short rigid wheelbase of 4 ft. 1 in., no doubt accounts for this. The lateral resistance of the special type of bogie control is found to entirely prevent any tendency to "nose" on straight track.

Principal dimensions are:—

Gauge	4 ft. 8½ in.
Cylinders	19 in. × 26 in.
Wheels, bogie	2 ft. 2 in. diam.
,, coupled	3 ft. 10 in. ,,
Wheelbase, semi-rigid	8 ft. 8 in.
,, rigid	4 ft. 1 in.
Heating surface, tubes and flues	1,642 sq. ft.
,, ,, firebox and circulating tubes	146·5 sq. ft.
Heating surface, total evaporative	1,788·5 sq. ft.
Superheating surface	390 sq. ft.
Grate area	33·8 sq. ft.
Boiler pressure	190 lb. per sq. in.

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Railway Amalgamations.

By W. E. S. BROWN.

JUST now, in view of the contemplated grouping of railways, it is interesting to refer to some of the amalgamations of years ago. The Great Western Railway is, as regards mileage, the largest in the British Isles, and is older by eleven years in its title term, than the "premier" railway, for it was incorporated in 1835, whilst the London and North Western, as such, only received its name in 1846. As originally incorporated, the length of the Great Western Railway was 118½ miles, the main line running from London to Bristol. Now, however, the system contains considerably more than a hundred separate undertakings, excluding joint lines like the Shropshire Union, Birkenhead and Chester, &c. The present main line, from Paddington to Penzance, represents an amalgamation of five different lines, and also includes two new ones. The main line route to Birkenhead via Birmingham is made up of eight lines, and that via Worcester of six lines.

Some of these lines received rather dubious "nicknames," as for instance the Great Western itself, which was called the G(reat) W(ay) R(ound), whilst the Oxford, Worcester, and Wolverhampton was dubbed the "Old Worse and Worse." During the construction of this latter line, there took place a serio-comic incident, in July, 1851, which was thus reported in a monthly periodical of that year:—"A desperate fight for the possession of a railway tunnel took place on Monday the 21st inst., near Cambden, a village in Worcestershire. Marchant, a contractor, having failed to complete his contract for the roadway through Muckleton Tunnel, on the Oxford, Worcester, and Wolverhampton Railway, the works were given over to Messrs. Peto and Betts for completion. Marchant resisted. On Sunday night, the Peto party, 500 strong, marched down to Muckleton Tunnel, in order that they might be first on the ground. On reaching the Worcester end of the tunnel the first detachment of about 200 men was met by Marchant, who armed to the teeth with pistols, barred the way and dared them to come on. The leader of the invading force, Mr. Cowdery, ordered his men not to strike a blow, while he carried on a parley. But the negotiation failed; and peremptory orders issuing from Mr. Brunel, the men made a desperate rush on the Marchant division, and were repelled with the casualties of broken heads and three dislocated shoulders. Hitherto, it appears, the 'navvies' had fought with feet and fists; but one of Marchant's men drawing a pistol, he was seized and a deep wound inflicted on his skull. This daunted Marchant, who retreated, and the army of Peto remained in possession of the field. Marchant, however, returned with some policemen from the Gloucester constabulary, a body of privates of the Gloucester Artillery, and two magistrates, who instantly began to read the Riot Act. But a second engagement began under the very nose of the peace-officers, and several combatants came off with broken limbs. Reinforcements now poured in; and Marchant, feeling defeat inevitable, adjourned with Mr. Brunel, in order that some *amicable* settlement might be made. The upshot was, that Messrs. Cubitt and Stephenson were appointed arbitrators, and the works suspended for a fortnight." Thus, "peace hath its victories, no less renowned than war."

The London and North Western comprises 45 at one time independent railways, besides a number of newer lines built by itself. The system, when incorporated in 1846, was then the largest in the country, with a length of 420 miles, whilst now its mileage is more than 2,000, a figure exceeded only by the Great Western. In 1846, the London and North Western consisted of the amalgamated London and Birmingham, Grand Junction, Manchester and Birmingham, and Liverpool and Manchester railways. Other notable lines afterwards annexed were the Chester and Holyhead, North Union, Preston and Lancaster, and Lancaster and Carlisle.

The present Great Eastern system (formerly the Eastern Counties Railway)

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Railways (England & Wales) in course of construction, & opened throughout, 1825-1843.

No.	Name.	Route.
1	Aylesbury	No.30, at Cheddington, to Aylesbury.
2	Birmingham and Derby.	No.30, at Birmingham and at Hampton, to Derby.
3	Birmingham and Gloucester.	No.30, at Birmingham, to No.11, at Cheltenham.
4	Bodmin and Wadebridge.	From near Bodmin to Wadebridge, Cornwall.
5	Bolton and Leigh.	Bolton to Leigh, and thence to No. 28, at Kenyon.
6	Bolton and Preston.	No.37, at Bolton, to No. 45, at Euxton.
7	Brandling Junction.	No.41, at Redheugh, to South Shields and Monkwearmouth.
8	Bristol and Exeter.	No.22, at Temple Mead, Bristol, to Exeter.
9	Bristol and Gloucester.	From Bristol, 7½ miles, to No.11, at Standish.
10	Canterbury and Whitstable.	Canterbury to Whitstable. (Stationary Engines).
11	Cheltenham & Great Western.	No.22, at Swindon, through Gloucester, to Cheltenham.
12	Chester and Birkenhead.	No.13, at Chester, to the Mersey, at Birkenhead.
13	Chester and Crewe.	No.20, at Crewe, to No.12, at Chester.
14	Clarence.	Tees, Port Clarence, to 50, at Sim Pasture.
15	Cromford and High Peak.	Cromford, Derbyshire, to Whaley Bridge, Cheshire. (Stationary Engines).
16	Durham and Sunderland.	Durham to Sunderland (Stationary Engines).
17	Durham Junction.	No.23, at Moorsley, to Usworth.
18	Eastern Counties.	London, by Colchester, to Norwich and Yarmouth.
19	Gosport Branch.	No.35, at Bishopstoke, to Gosport.
20	Grand Junction.	No.30, at Birmingham, to No.28, at Newton.
21	Great North of England.	No 54, near York, to the Tyne at Redheugh.
22	Great Western.	Paddington, London, to Temple Mead, Bristol.
23	Hartlepool.	Hartlepool to Moorsley.
24	Hull and Selby.	Humber Dock, Hull, to No. 26, at Selby.
25	Lancaster and Preston.	No.45, at Preston, to Lancaster.
26	Leeds and Selby.	Marsh Lane, Leeds, to the Ouse at Selby.
27	Leicester and Swannington.	The Soar, at Leicester, to Swannington.
28	Liverpool and Manchester.	Lime Street & Wapping, Liverpool, to Manchester.
29	Llanelly.	Llanelly to Llandibie, Carmarthenshire.
30	London and Birmingham.	Euston Grove, London, to No.20, at Birmingham.
31	London and Blackwall.	Fenchurch Street, to Brunswick Wharf, Blackwall. (Stationary Engines)
32	London and Brighton.	No.33, near Croydon, to Brighton.
33	London and Croydon.	No.34, 1¾ miles from London Bridge, to Croydon.
34	London and Greenwich.	South end of London Bridge, to Greenwich.
35	London and South Western.	Vauxhall, London, to Southampton.
36	Manchester and Birmingham.	Manchester, to No.20, at Chebsey, and at Crewe.
37	Manchester and Bolton.	Irwell Street, Manchester, to No. 6, at Bolton.
38	Manchester and Leeds.	Manchester, at No.44, to Normanton, near Wakefield.
39	Maryport and Carlisle.	Harbour of Maryport, to No.41, at Carlisle.
40	Midland Counties.	No.30, at Rugby, to Derby, 49 miles, & to Nottingham, 47¼ miles.
41	Newcastle and Carlisle.	Newcastle and Redheugh, to Carlisle.
42	Newcastle and North Shields.	Pilgrim Street, Newcastle, to North Shields.
43	Northern and Eastern.	No.18, at Stratford, to Bishop's Stortford.
44	North Midland.	Nos. 2 and 40, at Derby, to Hunslet Lane, Leeds
45	North Union.	No.28, at Parkside, by Wigan, to Preston.
46	Preston and Wyre.	No.25, at Preston, to Fleetwood-on-Wyre.
47	Sheffield and Manchester.	Spitalfields, Sheffield, to No.36, at Manchester.
48	Sheffield and Rotherham.	Brightside, Sheffield, to Rotherham, and to No.44.
49	South Eastern.	No.32, at Red Hill, 20 miles from London, to Dover.
50	Stockton and Darlington.	Stockton, by Darlington, to Whitton Park Colliery.
51	Taff Vale.	Merthyr Tydvil to the port of Cardiff.
52	West London.	Nos.22 and 30, near *Holdsden, to Kensington.
53	Whitby and Pickering.	Whitby Harbour to Pickering, N.R. of Yorkshire.
54	York and North Midland.	Tanner Row, York, to No.44, Altofts.

* Holdsden Green.

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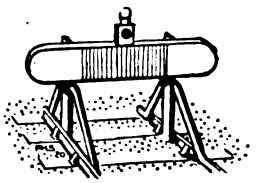
is formed of an amalgamation of several smaller lines, such as the Northern and Eastern, East Anglian, &c. The Midland Railway of to-day was formed in 1844, by the amalgamation of the North Midland, Birmingham and Derby, and Midland Counties, three lines incorporated in 1839. Later on, a number of other lines were absorbed, but the most notable feature of the Midland is its own extensions, such as the Bedford-St. Pancras, Settle-Carlisle, Heysham Harbour line, the absorption of the London, Tilbury and Southend line, and the acquiring of an entire system in Ireland, the Belfast and Northern Counties, now known as the Northern Counties Committee. The remaining trunk lines have been built up, more or less, in the same manner. When we reflect that in the "railway mania" year, 1846, no fewer than 272 acts were passed for new lines, this is not very surprising. During the last two decades the greatest effort for extension was probably that which resulted in the Great Central having its terminus in London; and its taking over of the Lancashire, Derbyshire, and East Coast line, may also be considered a bold enterprise. This line has also had its invidious "nicknames"; when known as the Manchester, Sheffield, and Lincolnshire, the initials were made to represent "Money Sunk and Lost," whilst G.C. represented "Gone Completely."

As things are to-day, probably some of the smaller lines would gain by absorption in the systems of their greater neighbours. The accompanying table is of interest as showing that in less than 20 years after the opening of the first public steam railway for passenger traffic (Stockton and Darlington line) in 1825, there were no fewer than 54 distinct companies in England and Wales on whose rails the carrying of passengers by steam-power was a main object. It will be seen that Nos. 10, 15, 16, and 31 were worked on the stationary principle, and a note concerning the two former may not be out of place. No. 10 had a length of 6¼ miles consisting of a series of inclined planes worked by stationary steam-power. It ran from the north side of Canterbury, adjoining the Stour, thence proceeding by St. Dunstan's, St. Stephen's, and Clowes Wood, to the Thames estuary at Whitstable bay, opposite the eastern point of the Isle of Sheppey. About 1½ miles from Canterbury it passed through a tunnel ½-mile long. The object of its projectors was the facilitating of trade between London and Canterbury. Coals were conveyed by this line from Whitstable to the latter, at less than half the previous charge. Before its opening, the number of passengers between Canterbury and Whitstable was about 4,000 yearly. In 1835, the line having been opened in May, 1830, no fewer than 26,000 persons were carried thereon, the fare being 9d for each. The length of No. 15 was 34 miles passing in its course over some high ground, its greatest elevation being 990 ft. above the level of the Cromford Canal. The ascent was accomplished by means of inclined planes, up which the vehicles were drawn by fixed steam-engines. The summit level was maintained for 12½ miles, the line passing through a hill by means of a tunnel 638 yards long. There were 52 bridges and viaducts. Instead of the usual malleable iron rails, the permanent way was laid with cast-iron ones, 4 ft. long, and weighing 63–84 lb. per yard. The chief *raison d'être* of this line was the connecting of the Cromford and Peak Forest canals by rail. In conclusion it may be noted that Nos. 3, 21, 22, 31, 32, 38, and 51 were opened exactly 80 years since, and the famous No. 50 on September 27, 1825.



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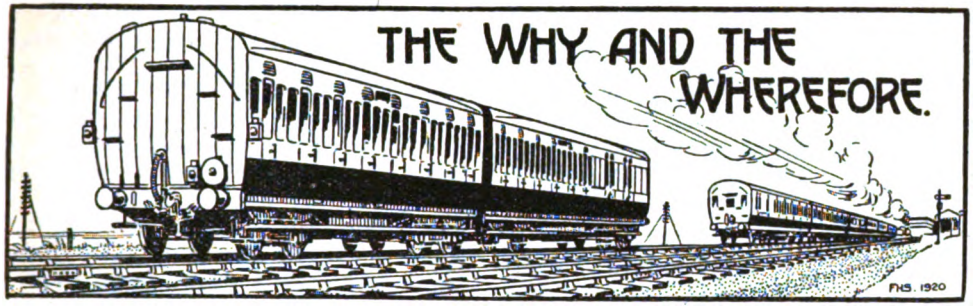

RAILWAY MAGAZINE *readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to locomotive sheds and to the dimensions of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. Queries respecting British Locomotive Practice and Performance should be sent to Mr. Cecil J. Allen, c/o* RAILWAY MAGAZINE, 30, *Fetter Lane, Fleet Street, London, E.C.4. Queries should not be of purely local interest. No reader should forward more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history and the like, readers should consult the pages of the "Railway Year Book." The twenty-fourth Annual Edition of this standard railway reference work is now on sale, 5s. net, or by post from the* RAILWAY MAGAZINE *Offices, 5s. 9d.*

Holyhead & Kingstown Mail Service.

Of the City of Dublin Steam Packet Company's fleet only two steamers remain, the *Ulster* and *Munster*. These vessels are in the market for sale, and at the time of writing are laid up in Holyhead Harbour. The new mail steamers of the London and North Western Railway, viz., the *Anglia* and *Hibernia*, are at present working the mail service, and they will soon be supplemented by two more steamers of the same class, the *Cambria* and *Scotia*, when they have been completed. The *Curraghmore* acts as a relief steamer on the mail service, pending the delivery of the new mail steamers She was built for the Greenore service, but as she was not completed until 1919, she was, of course, not on the Greenore service in pre-war days

[Reply to MAJOR J. A. D.]

Great Northern Railway Goods Trains in South London.

A regular service of goods and coal (principally the latter) trains is worked by the Great Northern Railway through *via* King's Cross and Ludgate Hill to Bricklayer's Arms and Hither Green (*via* Metropolitan Junction and London Bridge), Elephant and Castle and Herne Hill, Clapham Junction and Battersea Wharf (*via* Brixton); also to Norwood Junction *via* Herne Hill and Tulse Hill, the last-mentioned being the service you have noted. Similarly the London and North Western works through as far as Three Bridges, *via* the West London Line, Clapham Junction and Selhurst or Tulse Hill as required.

[Reply to F. B. SOWRY.]

Bury Locomotive "Coppernob."

A fully illustrated account of Furness Railway engine No. 3, built by Bury, Curtis & Kennedy, of Liverpool in 1846, appeared in the RAILWAY MAGAZINE, March, 1899. The Furness Railway placed the engine on a pedestal outside the Central station, Barrow-in-Furness in 1901. The history of the old engine is most interesting, as it worked regularly for about 54 years as a passenger and goods engine on the main line, and afterwards as a shunting engine in Barrow Docks.

[Reply to A. B. FILBY.]

Superheating on the London and North Western Railway.

No engine of the 4-6-0 goods type (nor of the 4-6-0 "Experiment" type, except No. 1361) has yet been superheated, preference in the matter of reconstruction having been given to other more important classes. It is not by any means an invariable practice to extend the smokebox well forward from the chimney in the case

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of superheated engines, as on some lines it is the chimney itself that is set forward; the general object of extended smokeboxes is that of arresting sparks.

[Reply to H.C.]

Early Victorian Composite Carriages.

See page 424, RAILWAY MAGAZINE, May, 1899, for sketch of first and second-class composite carriage, Grand Junction Railway, 1842. This was a through carriage that ran once a day from Manchester to Liverpool *via* Crewe. In the middle was a covered compartment for those who were willing to pay for the luxury, and at each end an open compartment, unprotected from wind or weather, for more economical passengers.

[Reply to A. B. GILES.]

Oil-Burning Locomotives in India.

The use of oil as locomotive fuel is by no means new in India, as it has been employed here and there for many years past. The Great Indian Peninsula Railway is, however, installing it on a considerable scale, including not only the new 2-10-0 tender engines and 0-8-4 tank engines of the class illustrated in the May RAILWAY MAGAZINE, but also many ordinary 4-4-0, 4-6-0, 4-4-2, and 2-8-0 locomotives.

[Reply to "WILSONIAN, LEICESTER."]

Dieppe-Paris Lines.

Boat trains began running *via* Pontoise June 25, 1913. The Dieppe-Paris line *via* Pontoise is 20 miles shorter than *via* Rouen. War stopped some of the works such as putting down of water troughs and the reconstruction of the bridge over the Oise. Much faster running will eventually be made. The 2 hours 47 minutes you quote includes 10 minutes for the passage through Dieppe from the Town to the Harbour station.

[Reply to H.J.J.G.]

Great Western Railway Tank Engines.

Conversion of the existing saddle-tanks to the more modern pannier tank arrangement is doubtless largely with a view to standardisation; the pannier arrangement also has the advantage of lowering somewhat the centre of gravity of the engine. We note that Rhondda and Swansea Bay 2-4-2 tank engine, No. 18, is now transferred to Landore in order to work the Swansea and Pontypool passenger service *via* Neath.

[Reply to T. J. NIELSON.]

Locomotive Comparisons.

On the basis of nominal tractive effort, the London, Brighton and South Coast 4-6-2 tank engine *Bessborough* is more powerful than one of the London and North Western superheated 4-6-2 tanks, but the North Western "Claughtons" exert a higher tractive force than the Brighton "Atlantics." Your other query merely invites an opinion on a very contentious subject.

[Reply to H. S. HACK.]

North Eastern Railway "Atlantics" Classes "V" and "Z."

Coupled wheels in all cases, 6 ft. 10 in. Cylinders: "V," 20 in. by 28 in.; "V1," 19½ in. by 28 in.; "Z" (3) 16½ in. by 26 in. Working pressure "V" and "V1" 180 lb.; "Z" 160 lb. Maclean's book on the "Locomotives of the North Eastern Railway is now out of print. You might obtain a copy through W. & G. Foyle, Ltd., 121-123, Charing Cross Road, London, W.C.2.

[Reply to H. STONE.]

Great Western Railway, Broad Gauge Conversion.

Conversion of all lines west of Exeter took place on Saturday and Sunday, May 21 and 22, 1892. Between Paddington and Exeter the railway was "mixed" gauge, and the third line was removed in sections at various times subsequently. The first important conversions—Gloucester to Hereford, Oxford to Wolverhampton &c.—took place as long ago as 1869.

[Reply to ARTHUR STAYNES.]

Brake Rodding.

Where the brake cylinder is carried by the underframe, obviously there must be a compensating system of levers between the brake rod and the brake blocks, but this can hardly be explained without a drawing. Bogie wheel axles usually have a little side play, but this need not be great, as the swing of the bogie provides all needed adjustment to curve conditions.

[Reply to W. UPTON.]

Steepest Gradient.

There are rack railways as steep as 1 in 2. Several narrow-gauge lines in

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India and elsewhere, such as the Kalka-Simla and Darjeeling-Himalayan, in India, have grades of 1 in 18, operated by adhesion. The steepest in the United Kingdom are the Causewayend and Commonhead inclines, North British Railway, in places as steep as 1 in 22.

[Reply to T. W. LINSELL.]

Oil-Firing on Locomotives.

No oil-fired engines are employed on the Great Western Railway, and we have not the exact figures at the moment in regard to the Great Central Railway. As regards the general economics of the question, read Mr. Cecil J. Allen's article on "British Locomotive Practice and Performance" in the August issue.

[Reply to G.R.P.]

London and North Western Railway Engine Boilers.

Boilers of the classes you refer to differ in each case, except as regards 0-8-0 goods (non-superheater) and 0-8-2 tanks, which two appear to be similar, but we do not know that these are ever interchanged. With regard to *individual* classes, exchange of boilers is quite common at Crewe.

[Reply to "BOGIE."]

Lock and Block Signalling.

The Sykes system is used on London and South Western Railway suburban lines. This is described in several standard works on railway signalling, such as Lewis's "Railway Signalling (Mechanical)," recently reviewed in the RAILWAY MAGAZINE.

[Reply to "SIGNAL."]

The Heaviest Locomotive.

With the exception of the Great Western Railway's 4-6-2 *Great Bear* we know of no heavier locomotive in this country than the new Caledonian three-cylinder 4-6-0, weighing 81 tons in working order. This refers, of course, to tender engines without including the weight of tenders.

[Reply to D. C. BAKER.]

Corridor Stock, London, Brighton and South Coast Railway.

Other than the Pullman Cars, the only corridor stock on this railway is the special "set" used on the "City" express train leaving London Bridge for Brighton at 5 p.m., and side corridor stock used in electrical working.

[Reply to "NEVIL."]

The "Great Bear" Great Western Railway.

Our latest information is to the effect that this famous engine is working daily the 9 a.m. from Paddington to Bristol, and returning with the 2.10 p.m. express. This may, however, be merely a temporary turn of duty.

[Reply to G. K. KING.]

Plymouth-Paddington, Great Western Railway.

Fastest recorded time between these two points is that of May 9, 1904, when the 246¾ miles via Bristol were covered in 226¾ min., including a stop of 3¾ min. at Pylle Hill, Bristol, to detach mails for the North.

[Reply to G. K. KING.]

North British Railway Locomotive Numbering.

We understand that the latest practice is to letter the tenders and tanks of passenger as well as goods locomotives on this railway with the large numerals, the crest between the letters "N.B." having been abandoned.

[Further reply to I.P.H.L.]

Glasgow District Subway.

At the time the subway was planned electric traction was in its infancy. A mechanical engineer was sent to America to study the latest methods of cable traction, and found that in similar works the cable was a distinct success.

[Reply to RONALD KEYES.]

Great Eastern Railway Amalgamations.

See RAILWAY YEAR BOOK, 1921, pages 127 and 128. The Eastern Counties and Northern and Eastern Railways were originally constructed on the 5 ft. gauge, but in 1844 this was converted to the 4 ft. 8½ in.

[Reply to J. C. CONWAY.]

Sunday Duty.

Under the agreements Sunday duty has to be paid for as such, whether additional to a six-day week, or a week-day "off" is allowed. A reply to another reader last month answers your second query.

[Reply to "A. H."]

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Longest Railway Bridges.

Tay Bridge, North British Railway, over 2 miles in length. The next longest is the Sone Bridge, at Dehri, East Indian Railway, 10,052 ft.

[Reply to T. W. LINSELL.]

North British Railway Locomotives.

You are correct in stating that both passenger and goods locomotives now bear large numerals between the letters "N.B." on the tender or tank sides.

[Reply to R. R. BAKER."

North Eastern Railway 4-Cylinder 4-4-2 Compounds.

These engines (Nos. 730 and 731), were experimentally fitted with Belpaire fireboxes, and are the only engines on the North Eastern Railway so equipped.

[Reply to "WAVERLEY."]

Great Eastern Locomotive Numbers.

Information reaches us that the numbering of this company's engines with large numerals on tender and tank sides is being extended to passenger engines.

[Further reply to "0-6-0."]

Locomotive Feed-Pumps.

The apparatus you noted was not a Westinghouse brake compressor, but a feed-pump for the boiler; the two are very similar in appearance.

[Reply to E. B. SOWRY.]

South Eastern and Chatham Railway's 2-6-0 No. 812.

The plain coned chimney on this engine is for experimental purposes. Your other query is not sufficiently clear to enable us to answer.

[Reply to D. CAMPBELL.]

Abbot's Ripton.

January 21, 1876. Scotch express in double collision. See RAILWAY YEAR BOOK, 1921, for list of notable railway accidents.

[Reply to W. B.]

North Eastern Railway Water Troughs.

Between Lucker and Belford, and between Northallerton and Danby Wiske. See RAILWAY YEAR BOOK, 1921, page 226.

[Reply to A. C. JOHNS.]

New "Baltic" Type Tank Engines, London, Brighton & South Coast Railway.

We believe that the engines now building are practically identical with No. 328 in all leading features.

[Reply to J. S. HYSLOP.]

London and South Western Railway's Portsmouth Route.

There is no restriction on the use of the heavy 4-6-0 engines from Waterloo to Portsmouth, if and when required.

[Reply to F.L.D.]

Rail Motor Cars.

We know of no petrol-electric car in public service on the Great Western Railway.

[Reply to A. R. HARRISON.]

A Midland Locomotive Query.

We know of no 4-coupled engines on this railway with continuous splashers similar to the North Eastern "R's."

[Reply to A.W.P.M.]

Brake Apparatus on Bogie Wheels, Midland Engines.

Brake is actuated by steam and is applied automatically to the wheels when the driver operates the vacuum brake.

[Reply to G.B.D.]

Derwent Valley Light Railway.

North Eastern Railway supplies a "Class O" tank engine, and this one engine suffices.

[Reply to A. R. HARRISON.]

Red Bank Box, Great Northern Railway.

Situated 154½ miles from King's Cross, and 1½ miles south of Doncaster passenger station.

[Reply to R.G.]

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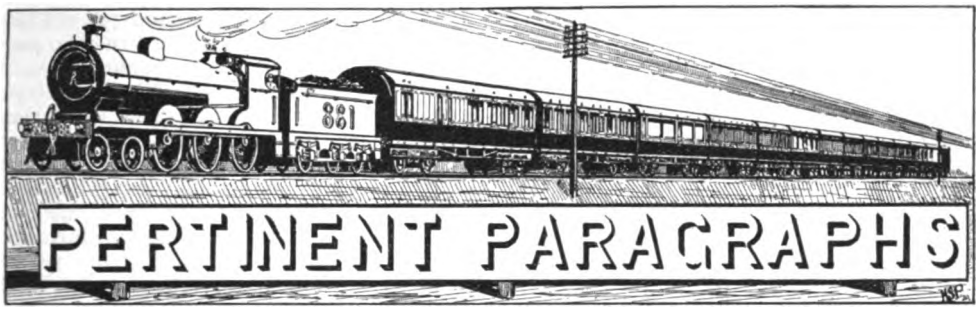

The Railways De-Controlled.

At midnight, on Monday, August 15, the control of railways came to an end, and once more the companies are free to conduct their own business in their own way, with the necessity—by no means a light problem—of meeting expenditure and financial obligations out of revenue. The payment of £60,000,000, and of £3,000,000 in the case of the Irish lines, is a compromise on account of payments in respect of arrears of maintenance and construction due to the war, and although this is really only the fair due of the companies, the fact that it is unhampered by conditions, and will avoid complicated negotiations which might otherwise have extended for a long period, renders it of material assistance towards the recovery of operating solvency. The "rush of development" which succeeded the termination of the coal crisis, including progressive summer train services, generous excursion arrangements, re-introduction of market and ordinary and commercial travellers' tickets, and other special facilities augur well for the future. Reductions in railway wages on the basis of falling "cost of living" figures have eased the wages problem, while adjustments in the direction of basing wages partially, if not wholly, upon the strenuity of the work entailed, in conjuncton with the establishment of the Central and National Wages Boards on a permanent basis under the Railways Bill, should avoid any serious difficulties in regard to railway labour.

Altogether, though the railway situation is still beset with difficulties, and even admitting that grouping and other arrangements covered by the Railways Bill will produce a good proportion of the operating economies claimed therefor, the railway managements are faced with a hard problem. The railways must, of necessity, feel their way for some time to come, and that this is realised is shown by the reduced interim dividends announced by many companies; but "live" methods, a progressive policy, a contented staff, and the co-operating influences of falling industrial costs and improving trade, should be able to produce once again sound and solvent railway companies, collaborating with the public for mutual benefit, and with an entire absence of even the appearance of antagonism.

In the case of the Irish railways, which also are now decontrolled, they are left virtually without any special provision for the future, but this is a matter for the Council of Ireland. Meanwhile the threatened labour difficulty appears in a fair way to satisfactory settlement, and there also, though the problem is in certain respects more acute than in Great Britain, there is no need for pessimism.

The Railways Bill in Parliament.

After many strenuous sittings, the Railways Bill was dismissed by the House of Commons, on Tuesday, August 9, and no doubt by the time this number of the Railway Magazine is published, will have passed the House of Lords also. During Committee proceedings, several amendments, beyond those mentioned last month, were made. Thus "hours of duty" were added to the terms of reference in the case of disputes referred to the Central and National Wages Boards. The numbers of directors of grouped railways are to be (as maxima): North Western, Midland and West Scottish, 28; North Eastern, Eastern and East Scottish, 28; Western, 25; and Southern, 21. Several important amendments were also made in regard to rates and charges. An agreed new clause was adopted to cover the vexed question of exceptional rates.

The Report stage was reached on July 27. A clause proposing to give road transport powers to railways generally was ruled out of order by the Speaker, also a clause in reference to the transfer of railway-owned canals. An amendment to provide that the Hull & Barnsley Railway should not be included in any group without the Hull Corporation's consent, was negatived. The date at which schemes for amalgamation should come into operation was altered from June 30 to January 1, 1923. An important

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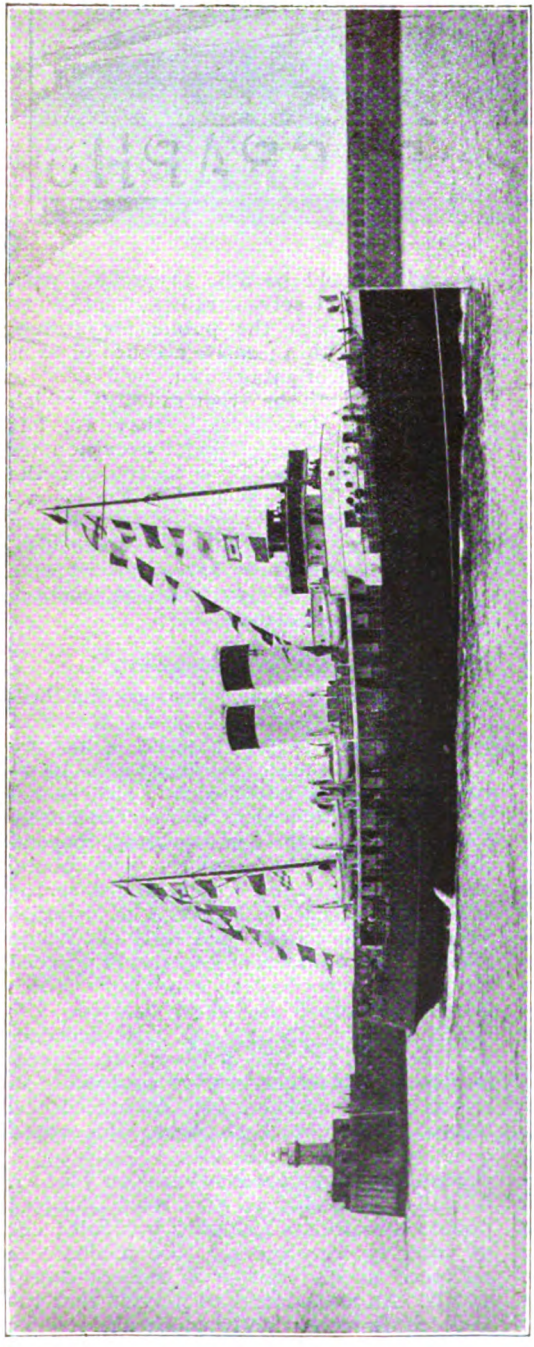

NEW STEAMSHIP "VERSAILLES," FOR FRENCH STATE AND L.B. & S.C. RAILWAYS' JOINT CONTINENTAL SERVICE.

Government amendment was carried to leave out sub-section (5) of Clause 2, which had provided that no amalgamation scheme should have any effect unless approved by a resolution passed by both Houses of Parliament. With regard to the Western group an amendment was inserted with respect to additional capital, so as to obviate the winding up of the Great Western Company and the formation of a new amalgamated company, subject, however, to the consent of the majority of the holders of the corresponding classes of securities affected. In Clause 11 amendments were made with the object of enabling worked and smaller companies, under certain circumstances, to ask the amalgamation tribunal for a share of the sum granted by the Government for composition of claims under the railway agreements. The House refused to disturb the proviso to Clause 48, which relieves a railway company of the obligation to cart for a trader who makes only a partial use of railway cartage.

Clause 61, dealing with the settlement of disputes as to pay and conditions was passed unamended in the form agreed between the great majority of railway companies and the railway unions. An amendment was made, by which certain Welsh lines become constituent, instead of subsidiary, companies in the Western group. Proposals to take the Midland & South Western Junction Railway out of the Western group, and the Wirral out of the North Western and Midland group were negatived. An amendment to transfer the Hull & Barnsley Railway from the North Eastern and Eastern group to the North Western and Midland group was rejected. On consideration of the second schedule (board of directors of amalgamated company), an amendment requiring that seven members of the board should be "elected from and by the workers on the amalgamated companies" was, after discussion, withdrawn.

New Steamer for Newhaven—Dieppe Service.

ALWAYS a popular route, and since the opening of the Pontoise route between Dieppe and Paris a speedy one also, the Continental services operated by the London, Brighton and South Coast and French State Railways via Newhaven and Dieppe are now

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served by four of the finest vessels crossing the Channel. In 1911 and 1912 the French State Railway replaced their older vessels by new turbine vessels, the *Newhaven* and the *Rouen*, and in 1913 the Brighton Company added the geared turbine steamer *Paris*, a considerable advance. In the *Versailles*, the French State Railways have gone a step further, challenging the supremacy of the *Paris* by a vessel which represents still further development and improvement. With these vessels the crossing is reduced to one of little more than 2½ hours, while the *Versailles*, in point of speed, construction and luxurious accommodation takes its place as one of the finest boats used for cross-Channel traffic.

Built at Graville, near Le Havre, by the Société des Forges et Chantiers de la Méditerranée, the *Versailles* is 305 ft. in length below perpendiculars, with a breadth moulded of 36 ft., and a depth of 23 ft. The boat deck amidships, extending some 170 ft., forms a promenade in great favour in fine weather, whilst the promenade deck proper goes the whole length of the ship. The vessel is licensed for 1,200 passengers, is equipped with life-saving equipment of the most modern type, and the accommodation, while generally corresponding with that of older vessels of the fleet, includes various improvements. The saloons and state-rooms are splendidly furnished and decorated, and constitute very fine examples of the latest and best styles of marine furnishing.

The Newhaven-Dieppe route to Paris is quite expeditious in point of time, seeing that, leaving Victoria at 10 a.m., Paris (St. Lazare) is reached at 6.20 p.m., while on the return, leaving Paris at 10 a.m., London is reached at 6.13 p.m. The night trains leave London at 8.20 p.m. and Paris at 9.5 p.m., the arrivals being respectively 6 a.m. and 7.55 a.m. Third-class passengers are conveyed by the night service. Arrangements are also made for passengers to remain on board at Dieppe and proceed in the early morning. Through bookings and convenient Continental connections are arranged on a liberal basis.

The inaugural trip of the *Versailles* on Saturday, August 6, was made the occasion of a special press inspection at Newhaven, and festivities at Brighton, attended by representatives of both the railways concerned, municipal officers of Dieppe and Brighton, British and French press representatives and others.

Workers Control for Railwaymen.

A PAMPHLET under this title written by Mr. G. D. H. Cole, and published at sixpence by the Labour Publishing Company, Limited, of 6, Tavistock Square, London, W.C. 1, has been sent for review, but instead of dealing with it on our "Railway Literature" page a few comments upon its tenour and the proposals advanced may fittingly be made here. It is not apparent what claims the author has to speak for railwaymen, and the general impression given is that while he may know a little about railwaymen and possibly the ordinary facts of railway working, he has no real conception of the business side of railway operation. For instance, after claiming that national ownership of the railway and allied transport services is essential, "not only because it is the condition of efficiency in these services themselves, but also because it is the condition of efficiency in many other spheres of social action," a statement which is very far from proved and which is generally denied except in socialistic circles, he suggests that "the workers must be given the fullest possible control over those things which they understand best, such as the actual running of a station, a goods yard or a locomotive shed." Coupled with suggestions later on that stationmasters, foremen, etc., should be elected by the staff they are to supervise, these are the very things which would cause disaster. Station staffs can only know traffic working from their own local and usually very restricted point of view, and unless a man has a much wider experience he cannot be in a position to appraise the business side of the working of his station. And the policy of election of the officer in charge would open the way to all sorts of abuses, and would usually cause the election of the most popular man, or of one who had set out with the object of attaining election, rather than the most capable person. Mr. Cole argues that stations, depôts or engine sheds are "the equivalents of the pit in the mining industry," which is just what they are not, for each pit is in large measure a self-contained business, whereas stations, goods yards and engine sheds are units of the system as a whole, much of whose business is related to the entire railway and but little strictly local.

Mr. Cole ignores entirely the problems of railway finance and economics, and he claims for the workers, manual and technical, the larger share of representation on his proposed Railway Executive. The residue, "representing the top grades which are still unorganised, should be for the present nominated by the State for these grades until the complete constitution of a railway guild becomes possible." All of which reads very plausibly, but leaves out of account all the real factors, such as the financial and economic aspects, the anomalies and peculiarities of human nature, the proved weaknesses which have attended

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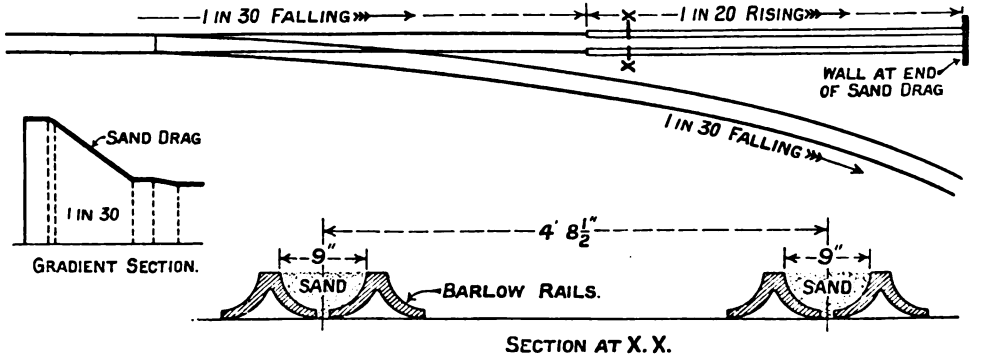
almost every attempt to carry on industry by representatives of the workers only, and the over-ruling fact that, whatever objections there may be on other grounds, the financial interest must and always will be in control. If a railway or other industry is to pay its way, the only posible method is for labour to adopt the same principles as those of capitalistic control; otherwise the "ruthless hand of economics" will quickly disillusion the well-meaning but biassed advocates of socialistic and like schemes. Workers are entitled to a voice in control and management, but it must be in regard to their duties and the part they contribute to the "working capital"—their labour. Similarly, the providers of capital, whether the State or shareholders, must have a controlling voice where the use of capital, in effect the business of the concern as a whole, is in question.

In its simplest form the sand drag constitutes an extension of the ordinary rails, connected by double catchpoints with the running lines. It is in the form of a trough filled with sand, into which the wheels of runaway vehicles are directed thus obtaining a high degree of retardation, while, at the same time, they are still subject to directional guidance. In later forms the ordinary rails are continued along the trough, so that the vehicle wheels continue to be directly guided, though they have to plough their way through the sand, and are, therefore, retarded as desired. The drawing reproduced shows an early form adopted on the Great Western Railway, each trough being formed by placing Barlow rails side by side in pairs. The retarding effect is further increased by placing the trough on a steep gradient against the runaway. The trough can, however, be constructed in any other suitable manner,



EARLY FORM OF SAND DRAG, GREAT WESTERN RAILWAY.

Sand Drags.

A SAND drag installed near Moor Street Station, Birmingham, on the Great Western Railway, recently enabled several runaway vehicles which had become separated in the tunnel from a goods train proceeding from Bordesley Junction to Wolverhampton to be safely brought to a stand, thus avoiding what might have been a serious accident. It is interesting to recall that devices of this kind have been employed in this country since 1887, when they were first adopted in Cornwall on the Great Western Railway. They are usually applied under conditions where the gradient is of considerable steepness and runaway vehicles may attain high speeds. Usual catchpoints and sidings may provide sufficient safeguard in ordinary conditions, but on steep grades the behaviour of runaway vehicles after leaving the running line may be erratic, and they will almost certainly become seriously damaged; hence the value of the sand drag in such circumstances.

and, where a running rail is provided through it, must, of course, be designed appropriately. Sand drags of either type can be applied facing or trailing, though the latter is necessarily the more usual. Thus, on the Great Western Railway, the sand drag at Moor Street, Birmingham is a trailing one, while at Carmarthen Junction a facing sand drag is provided for the protection of the river bridge at that place.

The efficiency of a sand drag varies somewhat with the weather conditions. Thus, in favourable weather, when the sand is dry and loose, it may bring vehicles to a stand more quickly than in bad weather, especially in time of frost, when the sand is liable to become hard, so that the vehicle wheels will, to some extent, run upon it before they break their way into it and begin to experience proper retardation influences. The device is, however, simple in construction and relatively inexpensive to provide, so that even although its efficiency may be variable, for which reason it may be neces-

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sary in the interests of safety to provide troughs of greater length than would ordinarily be required, there is much to be said for its wider adoption, not only in connection with trailing catchpoints on steep gradients, but also for facing purposes to safeguard trains which may run past adverse signals under conditions where great risk is incurred thereby.

Railways and the Motor Coach.

MR. E. N. BROMAGE sends an interesting letter in which he discusses the "wonderful motor-coach" and the "all-conquering" electric train. In regard to the former, he suggests that it is something which has taken the public fancy for the moment, aided by exceptional circumstances, "but its popularity is chiefly based on the novelty of road travel and not on actual superiority." He also contends that the motor-coach is a "spoiler of the country-side."

The question is a vital one in so far as motor-coach travel abstracts traffic which would otherwise go by rail, but it remains to be seen to what extent such abstraction will continue, or whether the motor-coach will not find its place partly as an aid to railway travel and partly as a creator of new traffic. Ever since their inception, the motor-coach and the motor omnibus, outside town limits have attracted a considerable volume of traffic of a touring and pleasure character. In some instances, this traffic would otherwise pass to the railways, especially where they provide for the same journeys; and with the re-issue of excursion facilities of a day and half-day character, there is every reason to believe that a large proportion of such traffic will be regained by the railway, in view of the relatively rapid transit on the journey and that a reasonable period of stay at the place visited is allowed, which is not usually the case with the motor coach, where the journey itself is often the main attraction. For long journeys in direct competition with the railway it is probable that a few trips made under less favourable conditions, as on a wet or stormy day, will make passengers less ready to book beforehand as usually required under motor-coach conditions, and the railway, expecially with the excursion and other special facilities now granted, will again become the recognised and standard medium of travel for longer distances. There will still be a wide field for the motor coach in regard to touring facilities and for routes not served directly by rail, and it is probable that a reasonable mean will establish itself, so that a popular method of travel, which at present appears severely competitive, will in the end prove to be the coadjutor and complement of the railway. On the goods side, motor road competition with the railway is a much more serious factor, but that is another story.

Electric Traction versus Steam.

IN regard to electric traction, Mr. Bromage admits that in strictly urban and suburban traffic electricity has steam at a disadvantage once it is installed and the heavy cost of conversion and equipment covered. He points out, however, that many advocates of electric traction, including the writers of several text books, are prone to make distinctly unfair comparisons. It is usual to find the performance of a heavy suburban train, of perhaps 300 tons, hauled probably by a relatively old tank engine, compared with the work of a three or six-coach electric train. Moreover, the latter usually includes various modern time-saving devices, such as automatic door-catches in the case of compartment stock, or vehicles of open type with wide sliding doors where entirely new stock is employed, both of which materially expedite station work. Consequently, station times are materially less than those of the steam trains with which comparison is made, although in this respect electrification is merely the factor which has caused the incorporation of such time-saving, methods.

Acceleration, again, is an aspect which is somewhat exaggerated. With the same loads and under the same conditions electricity certainly scores in this respect, but, once more, the comparison is frequently between trains which are not directly comparable, and, as a rule, the steam train has the greater load and is probably hauled by a less modern locomotive.

Mr. Bromage also remarks on the relative discomfort of travel in electric motor coaches owing to the fact that so much of the weight is concentrated upon the motor bogies and is not eased by the spring system. He mentions an instance where, travelling by an electric train on the London, Brighton & South Coast Railway, a somewhat exciting race occurred with a steam train drawn by an old 0-4-2 tank engine having, somewhat unusually, a relatively light load of six main line bogie vehicles, substantially the equivalent of the electric train load. The two trains left Victoria at the same time, but the steam train gained an entire length up the steep bank of 1 in 64 to Grosvenor Bridge. Our correspondent summarises this part of his letter in the following terms:—"So much for acceleration, but it goes to prove that, given the advantages that electricity is always favoured with, and a special design of tank locomotive, steam traction can more than hold its own." He also remarks that "The top speed of these

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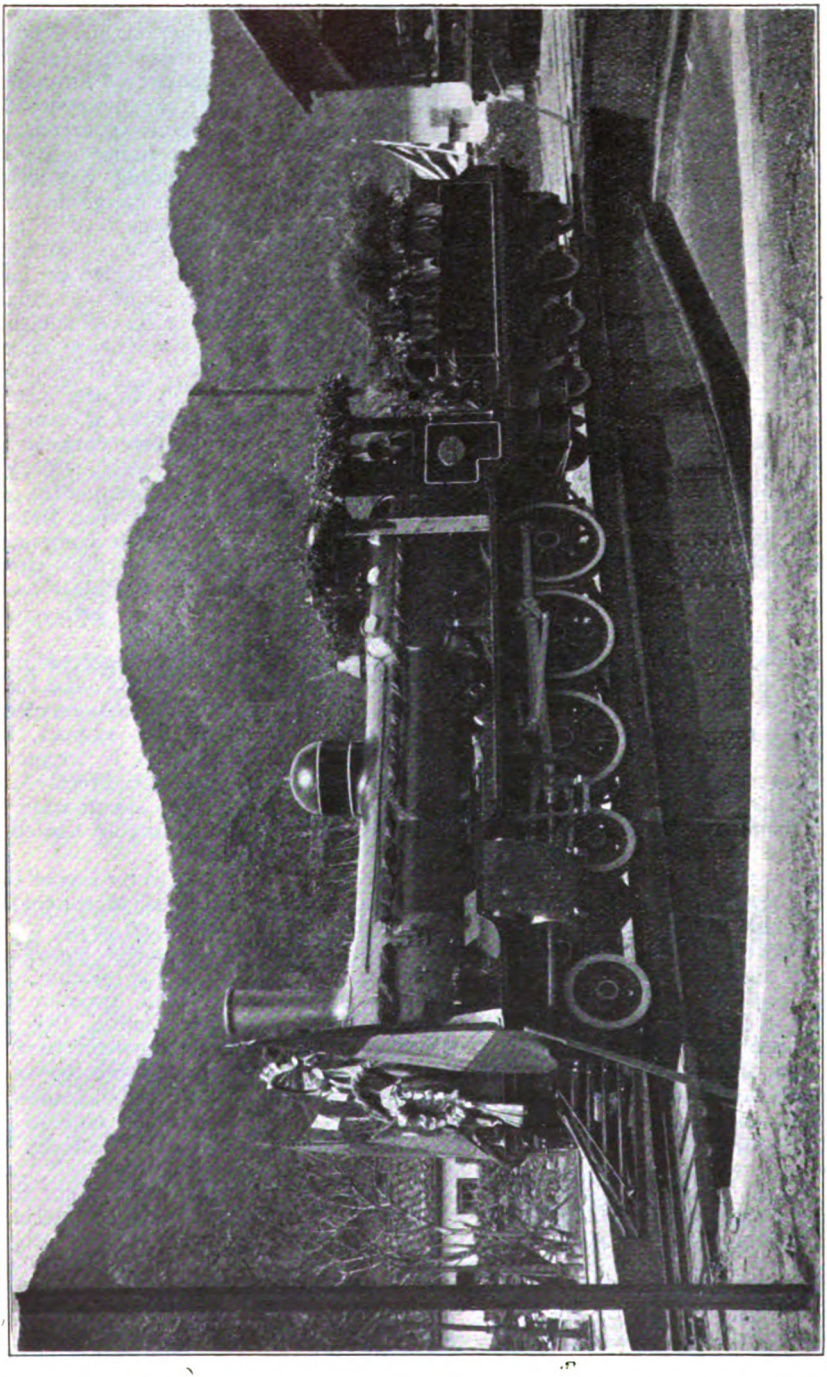

4-6-0 TYPE LOCOMOTIVE, LEOPOLDINA RAILWAY.

Built by Sir W. G. Armstrong, Whitworth & Co., Ltd., for the Leopoldina Railway, Brazil. Decorated for hauling the train conveying the King and Queen of the Belgians during their recent visit to Brazil. Cylinders, 16 in. by 22 in. Coupled wheels, 4 ft. 4 in. diam. Weight in working order, engine and tender, 56 tons 2½ cwt.

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electric trains is comparatively low, about 45 m.p.h., and once this is reached during a race the steam trains sail by, much to the joy of their partisans."

These remarks apply mainly to multiple-unit electric trains, but Mr. Bromage also has something to say about the conditions involved by the use of electric locomotives, which will almost certainly follow upon any comprehensive main line electrification. In that case, electricity will cease to have the advantage of motors distributed throughout the train, with the result that all its power must be exercised through one machine as in the case of a steam locomotive. In this connection, he remarks as follows :—" Travelling on the London, Tilbury and Southend section of the Midland Railway gives a good idea of the difference between steam and electric traction. Take a through train from Southend to Ealing and compare the motion after the electric locomotive is attached at Barking. Instead of running with a nice easy swing, the train travels, like a tram, in jerks and spasms amid a miniature electric-storm."

In conclusion, Mr. Bromage points out that although electric locomotives may in time have an interest of their own, his experience of lengthy trips in the United States is that an extended journey on an electric train is monotonous in the extreme. He suggests that other readers may have views of their own on this point. and that many will be equally " loth to see our splendid ' live ' locomotives and human drivers supplanted by soul-less ' electrics ' and ' motor-men '."

Railways and Road Transport.

On consideration of the Railways Bill in the House of Commons, the Speaker ruled that the proposed clause designed to grant road transport powers to the railway companies could not be discussed. Sir W. Joynson-Hicks submitted that the clause was outside the scope of the Bill, which was for the re-organisation and regulation of railways, and, although Major Hills, Major Hamilton and others submitted that the new clause was " an essential amendment to make the Bill fair to all railways," the Speaker decided that such a clause would need separate legislation. As a consequence, the railways remain in their old position, contributing vast sums of money to the upkeep of the roads without the right of reasonable user. One thing is clear: if the railways are not to be allowed to use the roads, they should be asked to contribute less towards their upkeep, as they are directly subsidising their road-using competitors.

The Railway Magazine can quite understand that the road carriers may not care for the prospect of the railway companies entering into competition with them, but they might keep to the facts of the case. Speaking on behalf of the Commercial Motor Users' Association, Mr. E. S. Shrapnell-Smith recently asserted that " the railways are paying less in total rates than motorists are paying in taxes. Motorists pay approximately £10,000,000 a year and the railways pay several millions less." Apart from the fact that the railways were, in 1912, already paying over £5,000,000 a year in rates and taxes, since when they have had to meet a greatly increased burden under both heads, what Mr. Shrapnell-Smith carefully refrains from saying is that owners of motor vehicles whether commercial or " pleasure " cars, are taxed according to the number of their vehicles, that is, according to the use which they make of the roads, while railway companies are rated for the upkeep of roads they do not use, but which are used by their competitors. Mr. Shrapnell-Smith does not object to a system under which railways subsidise their competitors, but when the railways ask for modest road transport powers, he at once scents a railway " monopoly " which will crush every other carrier out of existence. The truth is that monopolies are more likely to materialise if the road transport undertakings are artificially protected from railway competition.

North British Railway Claim against the Government.

Those Railway Magazine readers who are concerned or interested in railway finance have doubtless read in the general press the circular issued, over the signature of Mr. William Whitelaw, to the proprietors of the North British Railway. It succinctly furnishes all essential facts embodied in the dispute, which are as follows :—

The North British Railway Company's expenditure on repairs of engines and wagons was allowed by the Government from month to month throughout the period of control, including the first 11 months of 1920, till, without notice, the Ministry held back £430,000 for the month of December, 1920. When the Railway and Canal Commission sat in Edinburgh the second time, to hear the case on its merits, the Commissioners gave a unanimous judgment in favour of the company ordering the payment forthwith of the whole sum of £430,000. It appears that the question of making the deduction received only the most summary consideration at the hands of the Ministry; that the £430,000 was a mere random figure, and that the only ground upon which any attempt to justify the deduction could be made was that the Ministry considered that the North

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British Company's claims for repairs of engines and wagons for the year 1920 were above the *quantum* of similar repairs in 1913, and excessive. The Court not only unanimously repelled the contentions of the Ministry, that under the agreements the liability of the Government for repairs was limited to the *quantum* of 1913, but on the facts—as to which there is no appeal—held that the company's expenditure had been justified by the evidence. The Ministry have taken full advantage of the time allowed them for an appeal on a point of law, and owing to the rising of the Court of Session on July 20 for the summer vacation, the decision of this appeal cannot now be obtained before October or November.

The consequences to the railway company of the delay thus occasioned in obtaining a final judgment have been and are most embarrassing. Preference and ordinary dividends have been withheld, and as the Ministry have, on the same pretext as in the case of December, 1920, withheld large sums applicable to the current year, amounting to £550,000 to the end of May (making total deductions of £985,000 to that date) interim dividends hitherto annually paid in September may also have to be withheld. It is still open to the Ministry to consent to the payment, without prejudice to the final settlement with the company, following decontrol, of the compensation claimed and awarded by two unanimous decisions of the Commissioners.

London and North Western Railway Locomotives.

MESSRS. W. BEARDMORE have begun delivery of the order for ninety 4-6-0 "Prince of Wales" class locomotives. The first, No. 120 (Dalmuir Works, No. 174), is in service and is stationed at Crewe. This will be followed, writes the RAILWAY MAGAZINE Crewe correspondent, by nine others, viz.:—Nos. 123, 125, 129, 135, 140, 141, 142, 145 and 148. Some of these have already arrived at Carlisle, where, on local services, the engines thus ordered are to be broken in. The 0-6-2 tank engines previously numbered 120, etc., are now Nos. 3711 to 3720 in the duplicate list.

In addition to those mentioned on page 68 of the July RAILWAY MAGAZINE, the following four-cylinder "Claughton" class locomotives have recently been completed at Crewe:—Nos. 208, 210, 211, 517, 1216 and 1220. The first three replace 0-6-2 tank engines, which have been re-numbered 3292, 3453 and 3509 respectively, while the remainder take the numbers of scrapped 2-4-0 "Precedents," Nos. 183, 192, 205 and 207 of the same series were also 0-6-2 tank engines previously; these are now re-numbered 3044, 3068, 3154 and 3206 in the order given.

No. 1962 "Aurora" has been converted from four-cylinder compound to two-cylinder simple "Renown" class. The following four-cylinder compound mineral engines have been simplified and superheated:—Nos. 1240, 1289, 2056 and 2272. No. 549, 0-6-2 tank, has been fitted for motor service.

The Special DX goods Nos. 3155 (late 586) and 3457 (late 1227), have been withdrawn from service.

Several of the 2-8-0 Great Central type engines, working temporarily on this line, have had their London and North Western numbers painted out, and the corresponding R. O. D. numbers painted on, thus indicating probably that the engines in question are on the eve of being handed back to the Government.

Old-time Rail-roading in the United States.

MR. ARTHUR CURRAN, of the Locomotive and Railway Historical Society (U.S.A.), to which we have already made reference, sends a pamphlet entitled "Glimpses of Old-Time Railroading." Reference is, of course, to conditions in the United States, and affords an interesting comparison with corresponding records of railway working in the United Kingdom. A number of photographs of older U.S.A. locomotives are reproduced, and these are described. In regard to the engines, Mr. Curran points out that the balloon-stack was typical of the 'sixties, though it had been used before that time; the famous diamond-stack was characteristic of the 'seventies, and the cap stack was conspicuous in the 'eighties. The plain, straight stack and the tapered stack were both products of the 'nineties, though crude forms of them had been used since the earliest days of railroading. Boiler mountings and cabs of older American locomotives are often of use for historical identification.

"To the average student of locomotive history, the American type is associated chiefly with passenger service, though it is a fact that it was also used quite commonly in freight service, particularly in New England and on at least one road in New York State. When used in freight service, this type was generally fitted with small drivers to get more power with a given weight. The driving wheels of the passenger engines were usually larger, though there was no settled drift towards big wheels until the early 'nineties." Mr. Curran then proceeds to describe various old locomotives illustrated in detail. He may be further quoted in the following extract:—"Twenty or thirty years ago the Grand Central

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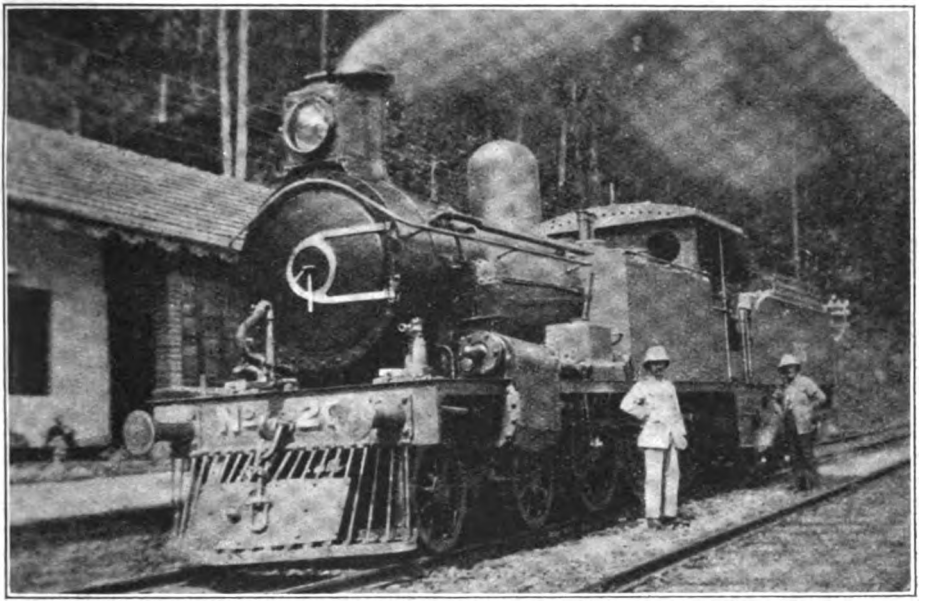
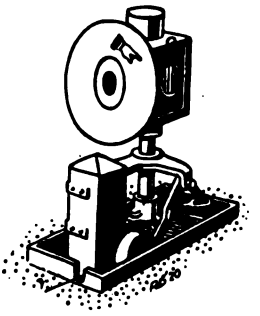


CEYLON GOVERNMENT RAILWAYS.
4-6-0 locomotive, No. 205.

station at New York City was one of the most interesting terminals in the country, though many who recall it did not realise this at the time. Looking back, however, to the days that will never return, one sees things in a mellow and most alluring perspective. The variety of engines to be seen was matched by the assortment of cars, which included the white postal cars of the New York Central, the red passenger cars of the same road, the yellow equipment of the Delaware and Hudson, the green cars of the New Haven, and the white cars of the New York and New England. The brown cars of the Boston and Albany and Boston and Maine roads were also occasionally seen, and many others which the author has forgotten."

A Ceylon Government Locomotive.

To Mr. A. A. Bowie, Junior, the RAILWAY MAGAZINE is indebted for the photograph reproduced on this page of a 4-6-0 locomotive of the Ceylon Government Railways. In forwarding his print from Lindula, Mr. Bowie remarks:—"This is one of the new locomotives built in Great Britain in 1920, shipped out here in pieces and put together at Colombo. Her number is 205. The lubricator, which you can see is on the side of the smoke box, is of the latest Detroit pattern. The valve gear is Walschaert.



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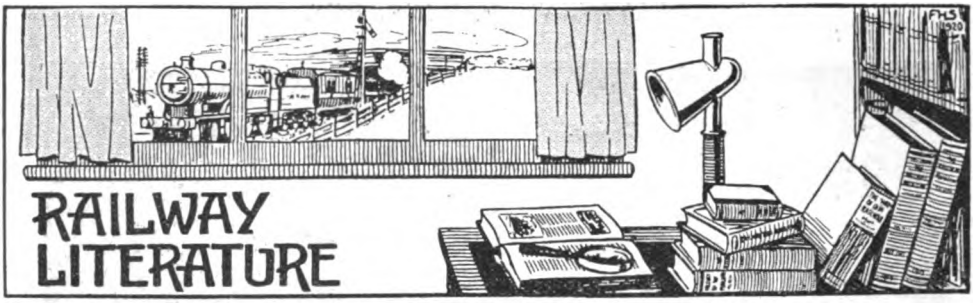


LOCOMOTIVE LIST FORMS. Robinson Bros., Egham, Surrey.

For the benefit of those who compile lists and particulars of locomotive engines, this firm is prepared to supply suitably ruled sheets. Sheet A has the following headings: No., Name, Built, Makers' or Works No., Rebuilt, Remarks on Rebuilding, Renumber and Date, Scrapped, Remarks and Class Index No. Sheet B has columns for all principal dimensions; while Sheet C serves where it is required to note only numbers and types, dates, &c. These are applied at 3s. 1d. per 100, 7s. for 250 or 26s. for 1,000 in foolscap size, or a little cheaper in quarto size. P. 7 forms, 7 in. by 6 in., are printed with the chief locomotive particulars required, intended to be used one for each engine or group of locomotives. These are printed as required, 14s. 6d. per 1,000 on white paper, or 16s. per 1,000 on tinted paper. Special binding covers for these forms can be supplied at 6s. each. A handy little Loco. Memo. Book is also supplied, price 3s. per doz., post free, containing several pages ruled for notes concerning engines seen when travelling by train or visiting a locomotive depôt.

AMERICAN CHAMBER OF COMMERCE IN LONDON: YEAR BOOK, 1921.

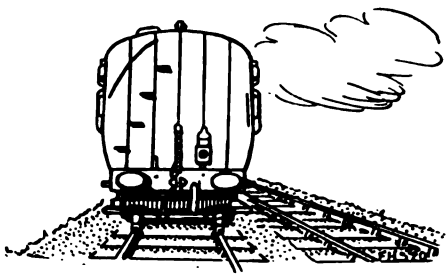
Issued from 8, Waterloo Place, Pall Mall, London, S.W.1., price 5s. net, this publication will be welcomed by all concerned in Anglo-American trade. The object of the American Chamber of Commerce in London is to promote trade relations between the United Kingdom and the United States, and to further the specific business interests of its members. In addition to general information, the alphabetical and classified list of members and firms will be appreciated.

INSTITUTION OF SIGNAL ENGINEERS: PROCEEDINGS, 1920. (W. H. Cotterill, Telegraph Department, Midland Railway, Derby.) Price 5s.

This volume contains the Eighth Annual Report, for 1920, and records steady progress, and an improved financial position. The membership at the end of the year included 7 foundation members, 10 honorary members, 173 members, 107 associate members, and 8 student members. Full reports of meetings and discussions are given in reference to papers on "British Railway Telegraphs, France, 1914–1919," by M. G. Tweedie, Capt. R.E.; "Track Circuit Nomenclature"; and "Problems of Track Circuit Lay-out," by W. C. Acfield.

AN EPITOME OF RAILWAY LAW. By E. G. Williams. (Sweet & Maxwell, 3, Chancery Lane, London, W.C. 2.) Price 10s. net.

This is a second edition of a volume which has received considerable support During the nine years since the first edition was published many developments have occurred, though, as the author points out, railway law is but little affected, whatever may be the situation in regard to railway operation. The exposition of railway law has, however, received amplitude and precision in many judicial decisions since 1912, and references to these, with other improvements, are incorporated in the new edition. There are three main sections, respectively, (1) "The Carriage of Goods," (2) "The Carriage of Passengers," and (3) "Railways and the Public."



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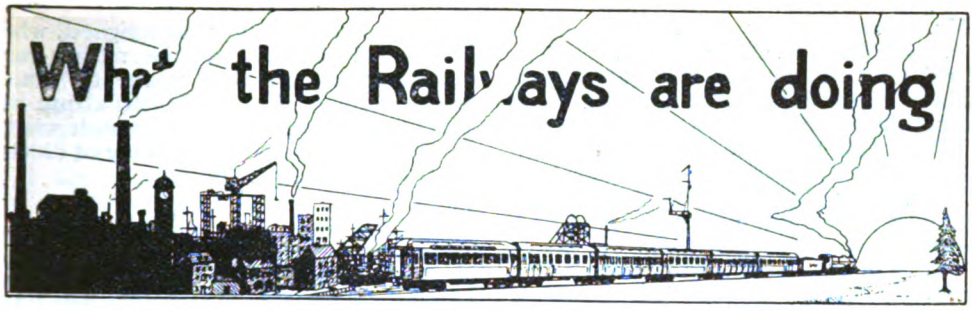

MR. WILLIAM ARMSTRONG has been appointed Superintendent of the Line of the Glasgow and South Western Railway in succession to Mr. C. E. Cockburn who has resigned owing to ill-health. Mr. Armstrong has been associated with the Glasgow and South Western since 1883, when he entered the service as a clerk at Old Cumnock Station, and, after filling various posts at this and other stations, he was transferred to the office of the Superintendent of the Line at Glasgow. In 1912, he was appointed Outdoor Superintendent, and in 1918 promoted to the position of Assistant Superintendent of the Line.

* * *

MR. CHARLES C. MACRAE, Chairman, London, Brighton and South Coast Railway, has resigned his position of Chairman and Director of the Railway Debenture and General Trust Company and the Railway Share Trust and Agency Company. Sir E. F. Coates, a director of those companies, has been appointed Chairman in his place.

* * *

WE regret to record the death of Mr. A. G. Pugh, Librarian of the Permanent Way Institution. Mr. Pugh was one of the Founding Members of the Permanent Way Institution, and was successively Treasurer, Secretary and Librarian. Early in life he was a permanent way inspector on the Midland Railway, and afterwards contractor for the preparation of permanent way materials at Beeston, Notts.

MR. WILLIAM ARMSTRONG,

Superintendent of the Line,
Glasgow & South Western Railway.

MR. JOHN FRASER, Chief Officer in London of the Operative Branch of the Midland Railway Telegraph Department, retired at the end of July, after nearly 49 years' service. He is succeeded by Mr. A. E. Ford, of the Midland Railway Telegraphs, Derby.

* * *

MR. F. H. HART, who was attached to the General Manager's Department of the Great Central Railway as Secretary of the company's side of the Conciliation Boards, retired at the end of July after 47 years' service. Mr. Hart was born in 1854, and joined the service of the Manchester Sheffield and Lincolnshire Railway in 1874. After receiving clerical experience at various stations he was, in 1888, appointed Chief Accounts Clerk at Hull (Kingston Street) Goods Station, and six years later was promoted to be Cashier at that station. Subsequently he became Chief of the Goods Accounts Office at Leicester. Mr. Hart was the Editor of the *Great Central Railway Journal*, which terminated publication during the war.

* * *

MR. EDWARD WATKIN has been elected a director of the Hull and Barnsley Railway Company in place of the late Mr. George Blake Walker. Mr. Watkin will continue the duties of General Manager which he began in 1905. Mr. Watkin is a nephew of the late Sir Edward Watkin—the "railway king"—and his whole business career has been devoted to railway service.

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MR. ALFRED TWIST has been appointed to succeed Mr. R. H. Cartwright who recently retired from the position of Great Western Railway Horse Superintendent. Mr. Twist entered the service in the Goods Department in 1888. Two years later he was transferred to the Horse Department, Hockley, and in 1900, when the Great Western Railway took over the cartage arrangements of their contractors at Bristol, Mr. Twist was placed in charge of the Horse Department at that depôt. In 1912 he was made Assistant Horse Superintendent at Hockley, and later was promoted to London as Mr. Cartwright's assistant.

* * *

MR. ALEXANDER R. MCCALLUM, B.Sc., has resigned his position as Chief Assistant to the Mechanical Engineer of the London Underground group to take up an appointment on the staff of C. P. Sandberg and Partners, Consulting Enginers, 40, Grosvenor Gardens, S.W.1. Mr. McCallum was born in 1886, received his technical training at the Central Technical College, and is an Associate of the City and Guilds of London Institute. He was a pupil at the Preston works of Dick, Kerr and Company, Limited, and in 1908 joined the London United Tramways. where he had a varied experience in different departments. He went in 1912 to the Underground as Assistant to the Mechanical Engineer, and in March, 1915, was given the appointment he now has resigned, where he has had charge of all the rolling-stock workshops and running repairs to trains. In the autumn of 1919 Mr. McCallum was one of a party of four officers which visited the United States to make a study of electric traction conditions there.

MR. A. R. McCALLUM, B.Sc.,

Chief Assistant to Mechanical Engineer, London Underground Group, 1915-21.

* * *

MR. JOHN MACDIARMID, Station Auditor of the North British Railway, recently retired from the service under the age limit, having served the company 47 years, 25 of which he spent as station auditor. To mark the occasion, at a large and representative gathering held in the North British Station Hotel, Edinburgh, under the chairmanship of Mr. Richard Brown, Audit Accountant, Mr. R. S. Beveridge, Parcel Agent, Glasgow (Queen Street), on behalf of the subscribers, who consisted of members of the staff at all parts of the system, presented to Mr. MacDiarmid a cheque for £130 as an appreciation of the high esteem in which he was held by all with whom his duties brought him into contact. Mr. MacDiarmid, in accepting the gift, related some interesting experiences of his recent six month's tour in the South of France and Italy.

* * *

Mr. A. S. Redman, C.B., R.E., who was appointed Traffic Superintendent of the Somerset and Dorset Joint Railway last year, in succession to Mr. G. H. Eyre, has resigned his post, which he has held for just over a twelve-month, and has returned to the War Office in an official capacity. He has been succeeded by Mr. W. T. England, formerly Assistant Superintendent of the London and South Western Railway at Exeter, but it is understood that this appointment is only temporary.

* * *

MR. W. FAIRLAMB, for many years Secretary of the Rhymney Railway, has died at Cardiff in his seventy-sixth year. He began his career with the West Hartlepool Harbour & Railway. When that company was amalgamated with the North Eastern Railway in 1865 he joined the secretarial staff at York. He became Secretary of the Rhymney Railway in 1888, and retired in March, 1918.

* * *

MR. WILLIAM WHITTAM, Manager of the Shropshire Union Railway & Canal Company, died in his carriage outside Tower Wharf Offices, Chester, on August 3. He lived at Hough Green, and had been in failing health for some time.

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WITH much regret we have to record the death of Monsieur L. P. A. Weissenbruch, "Administrateur" of the Belgian State Railways, but better known throughout the railway world as the General Secretary of the International Railway Association almost from its inception. Mons. Weissenbruch was also President of the Belgian "Ecoles Nationales de Chemins de Fer," while he had been the recipient of many honours and orders. He died on August 7, at the age of 64 years. Until a few days previously he had been engaged on the arrangements entailed by the Congress to be held at Rome next year.

* * *

MR. A. JENNINGS, who has been appointed Midland Passenger Agent at Manchester, in succession to Mr. G. C. Hawkins, retired, commenced his railway career as a boy at Stockingford, and filled junior grades at Arley and Southwell before becoming Booking Clerk at the last-named station. He removed to Birmingham where he ultimately held a senior position in the Inwards Parcels section, and was then promoted to be Chief Parcels Clerk at Bradford. Since leaving Bradford Mr. Jennings has been Chief Parcels Clerk at Leicester for some years, and vacates this position to take up the agency at Manchester.

MR. CHARLES E. ALLAN, D.L., having resigned his position on the board of the Belfast and County Down Railway, the directors have co-opted Mr. Samuel Kelly, C.B.E., Managing Director of J. Kelly, Limited, coal merchants, Station Street, Belfast, and of Bryansfield, Bangor, Co. Down, as a member of the board in place of Mr. Allan.

* * *

MR. H. E. BLAIN, Assistant Managing Director of the London Underground Group, has returned to London after his recent visit to the United States and Canada. Speaking to a press representative Mr. Blain is reported to have said: "Whilst in certain mechanical and equipment respects America can teach England something, I think England can teach America much on the scientific direction of traffic."

* * *

LADY GRANGER, wife of Judge Sir T. C. Granger, has given £10,000 to the Cottage Homes Fund of the North Eastern Railway, as a memorial of her brother, the late Dr. Tempest Anderson, for many years chief medical officer to the North Eastern Railway at York. Recently she opened a pair of cottages in Askham Lane, Acomb, a suburb of York. These are the second pair provided

LANCASHIRE & YORKSHIRE RAILWAY
MODERN CONTROL
MODERN CONTROL ENSURES
1. Satisfactory collection and delivery of traffic conveyed by passenger and goods trains.
2. Prompt clearance of traffic from Colliery and other Private Sidings.
3. Efficient passenger and goods train services.
4. Up to date road motor organisation.
5. Improved shipping facilities.
CHOOSE THE SITE FOR YOUR WORKS ALONGSIDE THE LANCASHIRE & YORKSHIRE RAILWAY.
CONSIGN YOUR TRAFFIC AND TRAVEL BY THAT RAILWAY THEREBY SECURING THE BENEFITS OF THE EXCELLENT SERVICES OFFERED.
HUNTS BANK MANCHESTER
ARTHUR WATSON, GENERAL MANAGER.

MODERN METHODS PICTORIALLY EXPRESSED.

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under the scheme. The cottages are not alms-houses. Rent is paid by the occupants on the merits of the case. Each cottage has three bedrooms, a living room and scullery, with all conveniences, a large garden at the back and a smaller one in front.

* * *

SEVERAL new and particularly attractive posters printed in colours have been published by the Lancashire and Yorkshire Railway, and two of them are reproduced in half-tone in this issue of the RAILWAY MAGAZINE. One deals with the control system which is in operation on the Lancashire and Yorkshire Railway and its object is to bring home to all and sundry that by its means the company is able to ensure the satisfactory collection and delivery of traffic conveyed by passenger and goods trains; prompt clearance of traffic from colliery and other private sidings; efficient passenger and goods train services; up-to-date road motor organisation; improved shipping facilities. The other makes an appeal to the public to assist in good timekeeping by joining and leaving trains quickly The posters constitute a distinctive departure in railway publicity.

* * *

A FURTHER advance in the development of facilities for the instruction of enginemen on the Great Central Railway has been made by the conversion of a parcels van into a travelling instruction car. The car contains sections of the various appliances fitted to modern locomotives. The fittings include the "Robinson" superheater, the "Reliostop" apparatus, ejectors, lubricators, brakes and others, and everything is well arranged. At one end of the car is a diagram cupboard for 24 sheets, convenient hoisting tackle being provided so that any diagram can be exhibited in a few seconds. An adjustable lecturer's stand is in close proximity, and facing this are several collapsible seats, to accommodate between 24 and 30 persons. There is also a suitable arrangement for showing lantern slides, the views being thrown on to a screen which is folded up and placed out of the way in the roof of the car when not in use. Trimmings of all descriptions are contained in a large glass case at the other end of the car, and nearby are models designed to afford instruction in the passage of steam through the cylinders. It is the intention to send the car to all the principal depôts, with a competent lecturer in charge, for the instruction of drivers, firemen and cleaners.

* * *

THE senior team of the Brighton Railway Centre of the St. John Ambulance Association, at the London, Brighton and South Coast Railway's London Bridge Station, on July 26, presented by Mr. Charles Colin Macrae, Chairman of the company, with the Challenge Shield, given by the Association in 1897 to encourage ambulance work on the railways, recently won by the team in competition with teams from other companies. In making the presentation, Mr. Macrae heartily congratulated the men, remarking that he was extremely proud that they should have won this splendid trophy for the company. Medals and prizes were also presented to the Brighton Loco. team, winners of the directors' Challenge Cup for seniors, and prizes to the Havant Traffic team, winners of the Challenge Cup for beginners. A photograph of the winning team was reproduced in the RAILWAY MAGAZINE, July, 1921, on page 67.

LANCASHIRE & YORKSHIRE RLY
ARRIVED TO TIME
Passengers can assist in maintaining an efficient and punctual service by joining and leaving trains quickly. Information relating to Train Services may be obtained from Mr Ashton Davies. Superintendent of the Line. Manchester

A PUNCTUALITY PREACHING POSTER.

* * *

IN the House of Commons on August 1, Mr. Gilbert asked the Minister of Transport whether railway servants under the labour agreement were allowed free railway passes on all railways in the country; whether

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members of the servants' families were also allowed privilege tickets at one-half and one-quarter fares, and if there was any limit to the issue of such tickets; whether there was a loss to the railway companies in carrying passengers on such terms; and whether the rates for ordinary passengers were increased in price in order to make up the loss on such tickets. Sir Eric Geddes in reply, said; "The answer to the first part of the question is in the negative. It has been the practice of the companies for many years to issue privilege tickets at reduced fares to the members of their staff and their families under certain conditions, and these privileges have been borne in mind in discussing the railwaymen's wages. It is not possible to give any estimate of the monetary value of the cost to the companies of such privileges, as the circumstances vary.

* * *

ACCORDING to a Leeds correspondent, "a great reduction in the price of Kaye's patent oil cans, lamps, etc., has been made." As RAILWAY MAGAZINE readers are aware this refers to the sundry manufactures of Joseph Kaye & Sons, Limited, the famous railway carriage door-lock firm.

* * *

H.R.H. THE DUKE OF YORK was present at a recent matinée concert given in the Kingston Empire Theatre, on behalf of the London & South Western Railway Servants' Orphanage, Woking. During an interval, Mr. T. C. R. Orme gave details concerning the work of the Orphanage, the doors of which, he said, were always open to the fatherless children of men who at the time of their death were in the employ of the London & South Western Railway.

* * *

EXCELLENT shooting was seen at the recent annual prize meeting of the Midland Rifle Club on the Derby Range. Seven of the 128 competitors registered highest possible scores. The competition for the club's challenge cup was particularly keen, a number of ties having to be shot off before the destination of the minor prizes which accompanied it could be determined. The trophy was won by Mr. J. Dobson, Derby, and was thus brought back to headquarters from London, where it had been held for the past year by Mr. P. R. Spencer, who now took second place. Firing was in progress for nine hours, during which about 10,000 rounds of ammunition were disposed of. Mr. J. Dalziel acted as chief range officer. Discharging the secretarial duties of the meeting for the first time, Mr. F. W. Bracegirdle gave every satisfaction. He received valuable assistance in the statistical work from Mr. F. H. Tyrer and Mr. F. W. Perkins.

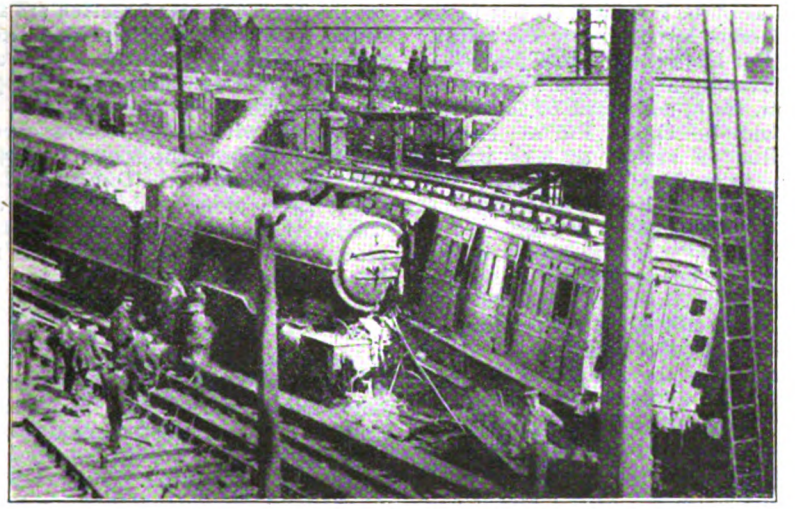

Photo.] [*Topical.*

SCENE AFTER THE ACCIDENT AT SELBY, NORTH EASTERN RAILWAY, AUGUST 6, 1921.

(*See paragraph on page* 218.)

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AMONG the minor facilities provided by railways is that of forwarding letters by train, and attention to this convenience has been recalled by a recent circular of the Postmaster-General. Trouble has been caused to retail traders by the discontinuance of letter collections on Sundays, owing to the fact that their wholesale agents do not receive their orders until after the first post on Monday, with a consequent delay in the replenishment of their stock. The circular points out that the "railway letter" post affords a method of securing earlier delivery of correspondence in such cases. Letters must not exceed 3 oz. in weight, and should be handed in at the passenger booking office at any railway station. On arrival at the town of address they can either be called for at the station or they will be put in the nearest post office letter-box by the railway company. For instance, a letter handed in on Sunday evening at Brighton in time for the 7.35 p.m. train, addressed to Smithfield Market, could be called for at London Bridge Station on arrival at 9.17 p.m., if the envelope is marked "to be called for," or would be delivered by the first post next morning if the envelope is marked "to be posted on arrival." A railway letter will be passed on by one company to another and despatched by the next available train if the station of address is on a different line from the station of acceptance. A fee of 4d. is charged by the companies on every railway letter, in addition to postage at the ordinary rate (2d.). The fees must be prepaid, the postage in stamps and the railway fees in cash, on handing the letter to the booking clerk.

* * *

ON returning from some travels in France, Mr. J. Macartney Robbins, writes to the RAILWAY MAGAZINE as follows:—"You may remember that in 1914 some 4-6-4 superheater tank engines were built by Beyer and Peacock, Gorton, for Holland. At the outbreak of the war, the War Office sent them over to France for work there. I saw several of them working around Paris (Gare du Nord) on local trains. I believe some are stationed at Creil. One or two have been newly painted and retain brass domes and safety valve casing. There are a great number of German (chiefly Prussian) engines to be seen at all the principal sheds. These are chiefly 0-8-0 and various species of tank engines. I saw one Bavarian (No. 3353) 4-6-0 largest type allocated to Chemin de fer de l'Est. German engines are even to be seen as far south as Grenoble. The R.O.D. 2-8-0 Baldwin-make engines are also largely in evidence."

SEVERAL new locomotives have recently appeared on the express trains of the North British Railway. The "Atlantic" class has been further added to during the past few months. The new locomotives are identical with the 20 already in service. No. 509, *Duke of Rothesay*, is working regularly on the 3.40 p.m. Aberdeen to Edinburgh train. The numbers of the new locomotives are those which formerly belonged to the Drummond 0-6-0's. No. 501 is a new 4-4-0 "Scott" class engine, *Simon Glover*. It has been working regularly on the 8.47 a.m. Glasgow to Arbroath train, returning from the latter place at 2.42 p.m. No. 505 is a "Glen" class engine and has been working the "Lothian Coast Express." The "Glen" class, although originally intended for service on the West Highland section are now to be found all over the system and exceedingly useful machines they are. Several of Mr. Reid's large 0-4-4 tanks, built in 1909, have been in the shops recently and are now appearing with safety valves over the fire box instead above the dome. No. 350, rebuilt thus, is working on the Dundee and Arbroath Joint Line, along with 349, 351 and 352; the latter, however, are still in their original state. No. 355 is usually to be found on the Dundee and Tayport service.

* * *

MR. MALCOLM NIVEN writes in reference to three-cylinder 2-8-0 locomotive No. 477, Great Northern Railway, illustrated in the July RAILWAY MAGAZINE, making interesting comparisons with the old 2-4-0 engine whose number it has taken. The latter was built in 1889, by Mr. Patrick Stirling, had 17½ in. by 26 in. cylinders, and 6 ft. 7½ in. coupled wheels. Total weight was 39 tons, compared with 75 tons 16 cwt. for its successor. The two engines indicate most strikingly the developments in dimensions and power, though they are for different duties, of the intervening period.

* * *

MR. NIVEN also sends some remarks concerning old Glasgow and South Western Railway locomotives. Of the old Stirling 2-4-0's for the Greenock section, with 6 ft. 1 in. coupled wheels, numbered between 59 and 104, only one remains, No. 71A, renumbered 727. A few Smellie engines of the No. 18 class are still in service, but otherwise the 2-4-0 type is dying out. Those remaining are 18A, 26A, 28A, 40A, 42A, and 158A, renumbered respectively 720–725. The four old 0-4-4 tank engines built by Mr. Smellie in 1789 are still running, Nos. 1A, 2A, 21A and 38A, now renumbered 728–731 respectively.

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RAILWAY club members recently paid a visit to the London and North Western Railway carriage sheds at Euston. The Hon. Secretary reports :—"Nearly all the principal types of vehicles in service were inspected, and the many small but important improvements introduced during the past 20 years were noted. The heating system, brake gear and other mechanical fittings were explained by Mr. Webb, and a demonstration with the vacuum cleaner was given. We should like to express our gratitude to Mr. H. D. Earl, carriage superintendent, London and North Western Railway, to Mr. Lewis, who is in charge at Euston, and to Mr. Webb, who very kindly conducted the party through the sheds and went to considerable trouble to make the time pass pleasantly." The autumn and winter activities of the club are being arranged, and a very attractive programme of functions is promised. RAILWAY MAGAZINE readers, particularly those resident within the metropolitan area, who desire to participate by becoming members, should communicate at once with Mr. Basil M. Bazley at the club's headquarters, Leplay House, 65, Belgrave Road, S.W. 1.

* * *

To supplement a reply given to a RAILWAY MAGAZINE reader in our August issue, concerning the Exmouth branch of the London and South Western Railway, Mr. A. M. Bushell writes :—"The line is double as far as Topsham and then merges into a single line which is continued to Exmouth. The staff is taken at Topsham and given up at Lympstone. Going to Exmouth from Exeter on the right-hand side after leaving Topsham a line branches off which runs past the electric light station and goes on to a quay where the line merges into a triangle. Several years ago I believe ships were built there. The next siding is on the left after leaving Topsham and runs to Odham's Manure Factory (now disused). Before one gets into Exmouth there is the Salterton line branching off to the left and on the right before one gets into Exmourh station there is a line to Exmouth Docks and a goods train is run daily to this place (Sundays excepted)."

* * *

IT is reported by the Ministry of Transport that the number of passenger journeys (excluding season ticket holders) for May, 1921, was 81,814,378, or 25·63 per cent. less than in March, but the passenger train miles were reduced by no less than 43·20 per cent. As regards freight traffic, the total tonnage conveyed in May, 1921, was 7,158,425 tons, and showed a decline of 21¼ million tons, or 75 per cent., compared with May, 1920, and the ton-miles worked were 497,834,670, a decrease of 70 per cent. Freight train mileage shows a reduction of 60·8 per cent. compared with May, 1920, but the decrease in coal and coke and other heavy traffics again seriously affected the operating results, although not to the same extent as in April. The average wagon and train loads were 3·72 tons and 103¾ tons respectively as compared with 5·45 tons and 134½ tons in May, 1920, and the net ton-miles worked per engine hour were 360, as against 435½ in the corresponding month of last year. The new rolling-stock completed and put into traffic during the month was 37 steam locomotives, 51 passenger carriages, and 2,160 wagons.

* * *

FOUR striking posters of Wimbledon, Epsom, the North Downs and Boxmoor have just been published by the London Underground Railways. These are of more than passing interest as, apart from their general composition and colour tones, they were the four best designs in last year's competition held at the Royal College of Art. The London Underground Railways have agreed to accept the winning designs for this year's examination which is to be held in September. By so doing they hope to stimulate concern in the younger artists in the scope afforded to improve modern pictorial publicity.

* * *

FOR 1921 a new edition of the Wirral Railway, Holiday and Residential Guide has been published. It is being distributed gratuitously from the offices of Mr. J. H. Burns, Traffic Manager, New Brighton. As a holiday resort the Wirral Peninsula is well-known to golfers and yachtsmen but in addition it possesses very fine facilities for family holiday-making and deserves to be better known in London and the Midlands. The journey is by no means troublesome. Passengers arriving in Liverpool from distant towns by the London and North Western, Midland, Cheshire Lines, Great Northern or Great Central Railways will find the shortest route to Wallasey and New Brighton is from the Central (low level) station of the Mersey Railway, immediately underneath the Cheshire Line's Central Station. Passengers arriving by the Lancashire and Yorkshire Railway in Liverpool should book at the James' Street Station of the Mersey Railway (five minutes from Liverpool Exchange Station, Lancashire and Yorkshire) to which there is a subway from Water Street.

* * *

THREE new posters of considerable artistic merit have appeared this summer at Great Eastern Railway stations and on public

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hoardings. One is a vivid scene at Parkeston Quay, as the turbine steamer *Antwerp* is leaving for the Continent, the night effect of quayside and vessel lighting being well portrayed. Another is a charming view of High Beech from Strawberry Hill, designed to advertise the scenic attributes of the Epping Forest district—"London's Beautiful Woodlands"—accessible from so many Great Eastern Railway stations. The third depicts a modern young lady "on the cliffs by the sea, where red poppies are spread," and most effectively directs attention to the holiday and æsthetic attractions of the Norfolk Coast resorts.

* * * *

MEMBERS of the National Union of Railwaymen have been celebrating the fiftieth anniversary of the foundation of the Amalgamated Society of Railway Servants. It is stated that there are 81 veterans still living of the members of the A.S.R.S., who joined the union in the first year of its existence, and that 13 of these are believed to be still working. The Society was reconstituted as the National Union of Railwaymen in 1913.

* * *

CONCERNING North London trains west of Kew and the historical questions raised in recent numbers of THE RAILWAY MAGAZINE, the Rev. W. J. Scott, B.A., writes:—

"Mr. Sekon's illuminating article in *Transport and Travel Monthly* for August really settles the question. It is quite plain that from June 1 to end of October, 1854, there were through north London trains, via Kew Old Junction and Hounslow and Feltham, to and from Windsor (London and South Western Railway); also that this service ran for five months only, and was never restored. But there is one statement which I fail to understand; on page 88 Mr. Sekon says 'The two big companies (*i.e.*, in 1865) still worked the line for 33 per cent. of the receipts,' &c. But surely, as the writer shows, it was the North London Company who worked the line; true, the London and South Western ran some goods trains over it, but that they still do, though certainly not now one of the owning companies. Does Mr. Sekon mean that the North London really acted on behalf of 'the two big companies'? That would be quite a possible arrangement, with parallels elsewhere, I think.

"I am honestly asking for information, not indirectly criticising a truly admirable article. Also (page 87) 'Camden Road (now Camden Town).' I thought the old (abandoned) 'Camden Road' and the present 'Camden Town' stations were separate structures, about 10 chains or so apart; but very likely this was a mistaken idea. One point Mr. Sekon does not mention (for obvious reasons), but was not the (single) North and South Western Junction line continued, on South Western territory, far on into Brentford (London and South Western) yard, by what is now known as 'the Third line'? Even to-day I fancy that line runs into the North and South Western Junction line without any points at Kew Old Junction. Am I right as to this?"

* * *

ON Monday, August 15, at the decontrol of British and Irish railways, *The Times* published a railway number of a very comprehensive character. The subject of the leading article was "Our Railways and their Future." In addition to a large number of unsigned articles, the issue contained valuable contributions as follows:—"The Railways Act," by J. H. Balfour Browne, K.C.; "Railways and Local Taxation," by F. W. Showers; "Railway Nationalization—(1) The Case for," by A. G. Walkden, secretary of the Railway Clerks' Association; (2) "The Case Against," by Harold Cox; "The Councils," by Felix J. C. Pole, General Manager, Great Western Railway; "Economic Basis of Tariffs," by Sir William Acworth; "Statistics," by Arthur Watson, General Manager, London and North Western and Lancashire and Yorkshire Railways; "Safety First," by H. Raynar Wilson; "London Traffic," by Lord Ashfield; and "Train Control," by the editor of the *Railway Gazette*.

* * *

ON Saturday, August 6, a serious collision occurred at the south end of the up platform at Selby Station, North Eastern Railway. As the first portion of the 12.19 up Great Northern express was passing through the station on the through line it ran into the second coach of a North Eastern train from Bridlington to Leeds, which had been standing on the up platform line. An official explanation issued from York said that the signals were "off" for the Great Northern train. Two passengers were injured. The Great Northern engine was derailed, also the two leading coaches on the Leeds train, but the most serious material damage was to the signal-box and its contents, which were crushed by the derailed vehicles.

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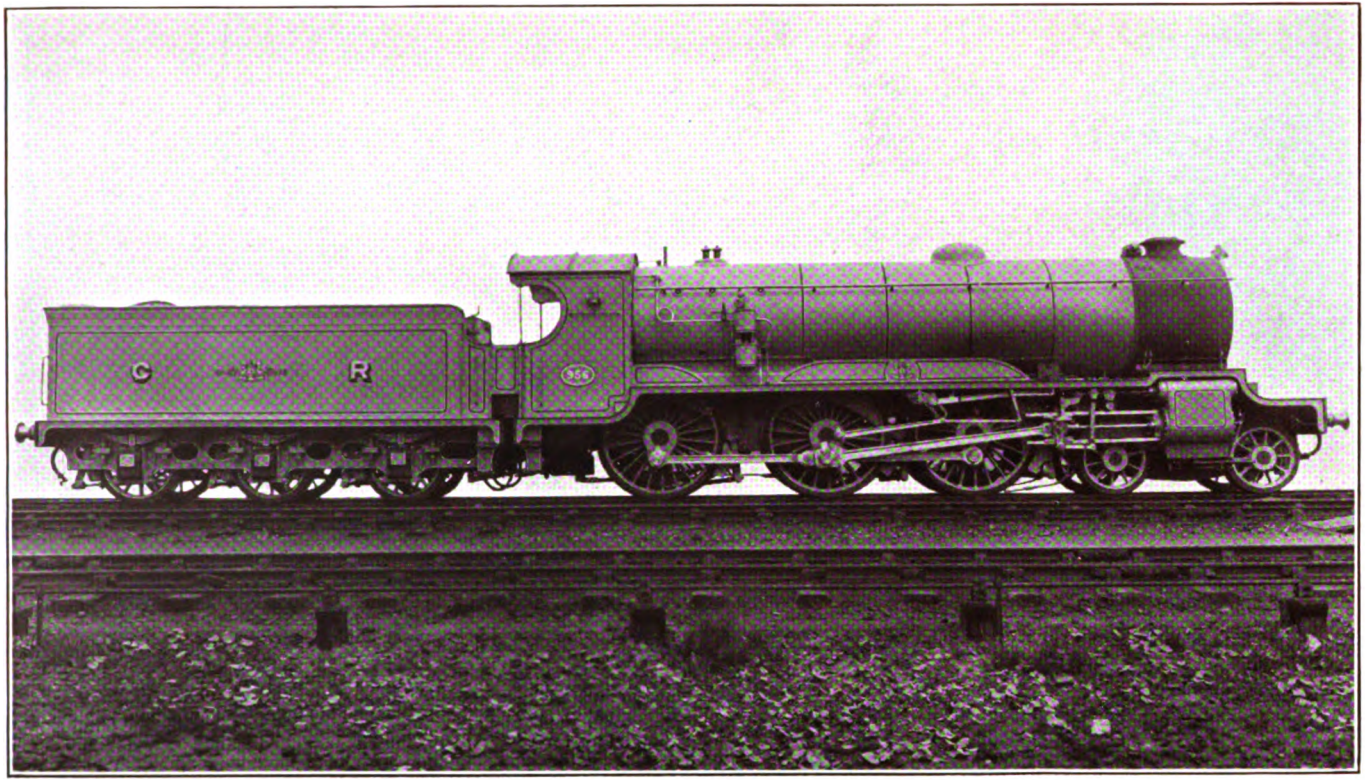

THE RAILWAY MAGAZINE.

THREE CYLINDER 4-6-0 EXPRESS PASSENGER LOCOMOTIVE No. 956, CALEDONIAN RAILWAY.

Designed by Mr. W. PICKERSGILL, C.B.E., Chief Mechanical Engineer.
Cylinders (3), 18½ in. by 26 in. Coupled Wheels, 6 ft. 1 in. diam. Steam Pressure, 180 lbs. per sq. in.
Heating Surface—Tubes (large), 500 sq. ft. ; Tubes (small), 1,700 sq. ft. ; Firebox, 170 sq. ft. ; Superheater, 270 sq. ft. ; Total, 2,640 sq. ft.
Grate Area, 28 sq. ft. Weight of Engine in working order, 81 tons. Weight of Tender (loaded), 48 tons.
Coal Capacity of Tender, 5½ tons. Water Capacity of Tender, 4,500 gallons.

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APPROACH TO ST. PANCRAS STATION, MIDLAND RAILWAY.

Traffic Working on the Midland Railway.

A description, in three parts, of the pioneer system of train control in Great Britain. All arrangements for the working of both passenger and freight traffic are centralised at Derby, and the distribution of rolling-stock is regulated by the Control staff.

1. ORGANISATION AND GENERAL PRINCIPLES.

By CHARLES TRAVIS, M.Inst.T., Joint author of "Practical Railway Working."

THE regulation of traffic working by means of a control system is undoubtedly the most effective scheme yet established by British railway companies in their progressive development towards more scientific railroading. Nearly every large British railway now has some form of control organisation, but so far, only two companies have established a system of central control for the supervision of traffic working all over the line.

One of these companies is the Lancashire and Yorkshire, whose central control is located at Manchester, and the other is the Midland, whose widely extended train control system I have recently had an opportunity of investigating at Derby and elsewhere. For facilities afforded, I would express my indebtedness to Mr. J. H. Follows, C.B.E., General Superintendent of the Midland, who has been closely concerned with control from its inception.

Initiation and Development of the Midland Control.

The system of control now in operation on the Midland Railway was evolved out of measures taken to reduce the long hours of trainmen in the congested industrial area of South Yorkshire, Nottinghamshire and Derbyshire. The necessity for improved arrangements for relieving trainmen became apparent in 1907, and in that year a special office for this purpose was established at Masboro', near Sheffield. In this office was centralised information as to the booking-on times of trainmen and other essential particulars, and the result was that the number of long-hour cases appreciably diminished. In fact, whereas there were over 20,000 cases in 1907 of unreasonably long hours of duty, there was not a single case in 1911.

The success of this effort made a big impression on Mr. Cecil Paget, then General Superintendent of the Midland

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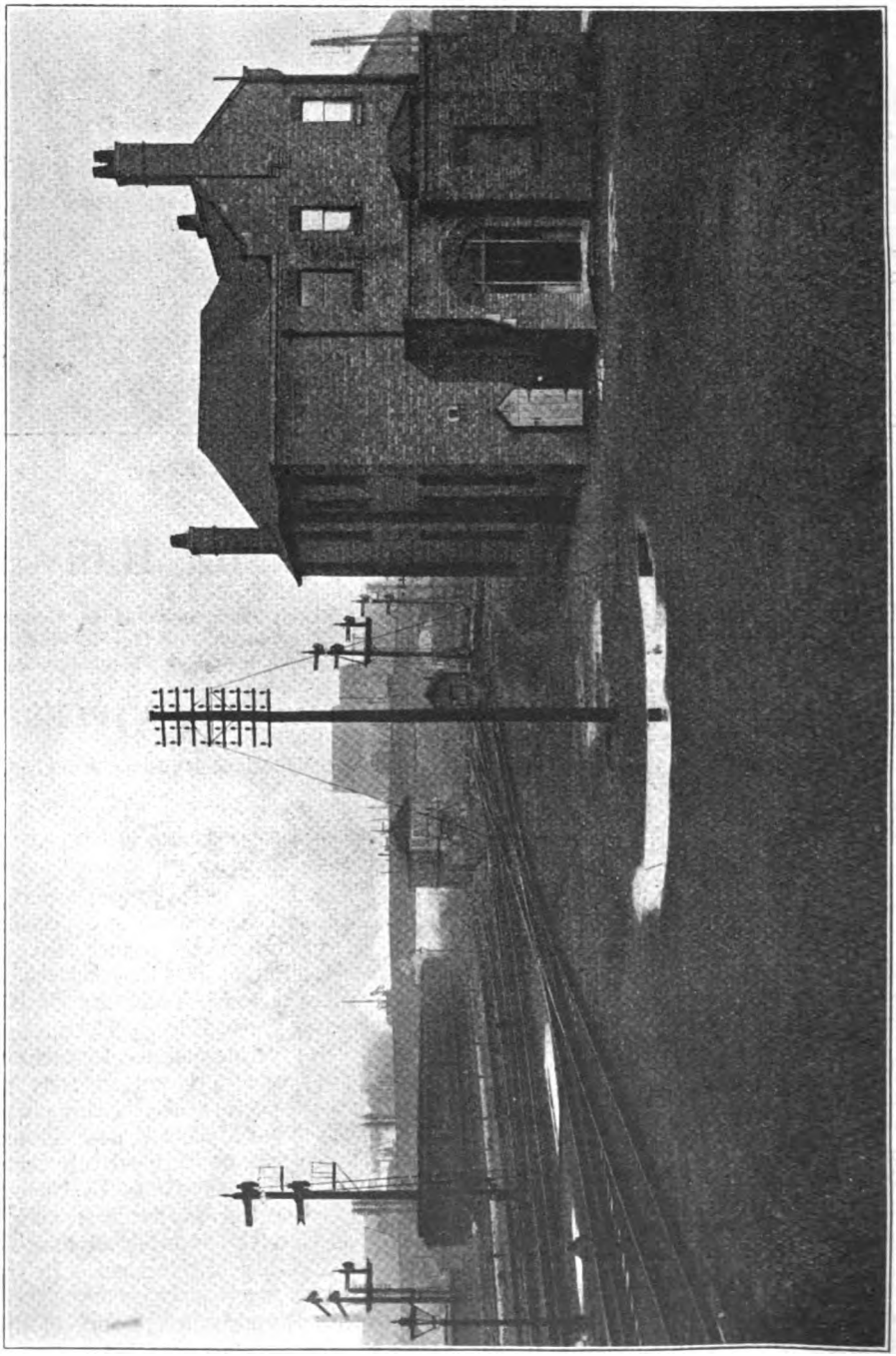

MASBORO' DISTRICT CONTROL OFFICE (MASBORO' STATION IN LEFT BACKGROUND).

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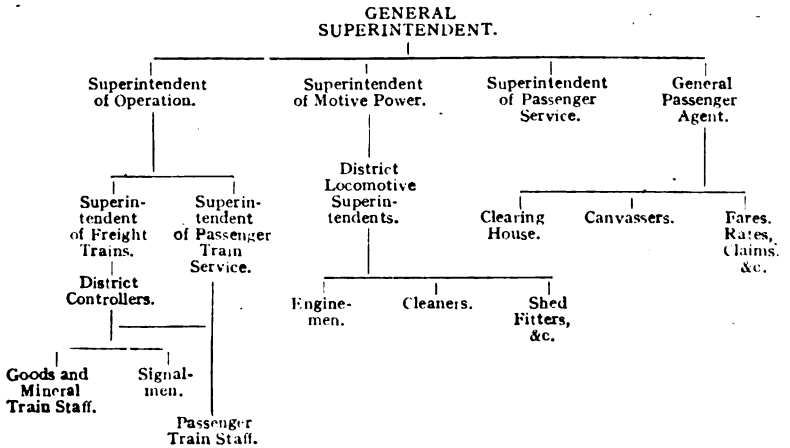
Railway, who had long had the idea of improving traffic working by the centralisation of "overhead" supervision. After long investigation in the Masboro' district, therefore, Mr. Paget arranged for the relief staff there to function experimentally as a train control, and this was undeniably the first real control operating on any main line railway in this country. The new office, equipped with a suitable telephonic installation, was so successful in relieving, and, what is more important, obviating congestion, that Mr. Paget proposed the extension of this system of working. To this end the whole of the Midland line was, in 1908, examined to ascertain the possibility of the scheme, and estimates of the amounts involved



OUTLINE OF MIDLAND RAILWAY OPERATING ORGANISATION.

for telephonic equipment, &c., were submitted to the directors, who sanctioned the expenditure.

So firmly convinced was Mr. Paget of the possibility of train control, that he decided to apply it first to the most congested section of the Midland line, and arrangements were made as from January 4, 1909, for all goods and mineral trains between Cudworth and Toton to be brought under the supervision of district controllers situated at Cudworth, Masboro', Staveley, Westhouses and Toton. The installation in this area abundantly justified its establishment, and the result was so satisfactory that the Midland directors decided to extend train control over the whole system. Nowadays, the Midland line is divided into 25 areas, varying in size according to traffic density, &c. In each area there is a district control office in telephonic communication with all stations, signal boxes, collieries, works' sidings and marshalling yards.

THE "PATH" SYSTEM.

It has frequently been stated that the success of the Midland train control is primarily due to the inauguration and maintenance of the "path" system of train working, and there is more than a little truth in the assertion. From the beginning it was recognised that the operating facilities could only be utilised to their maximum capacity by a scientific re-casting of train working. Line capacity naturally varies according to the traffic characteristics and the operating methods adopted, and the problem the Midland had first to face was to ensure the free running of heavy coal trains. To this end, an investigation as to the *workable* running capacity of various sections of the line was undertaken, and large diagrams showing used and optional "paths" for various classes of trains were prepared.

Following the completion of these diagrams, the booked timings for the various classes of trains were thoroughly overhauled, and where necessary, revised, and train diagrams were then prepared. With due regard to the public interest, the services were built up with special

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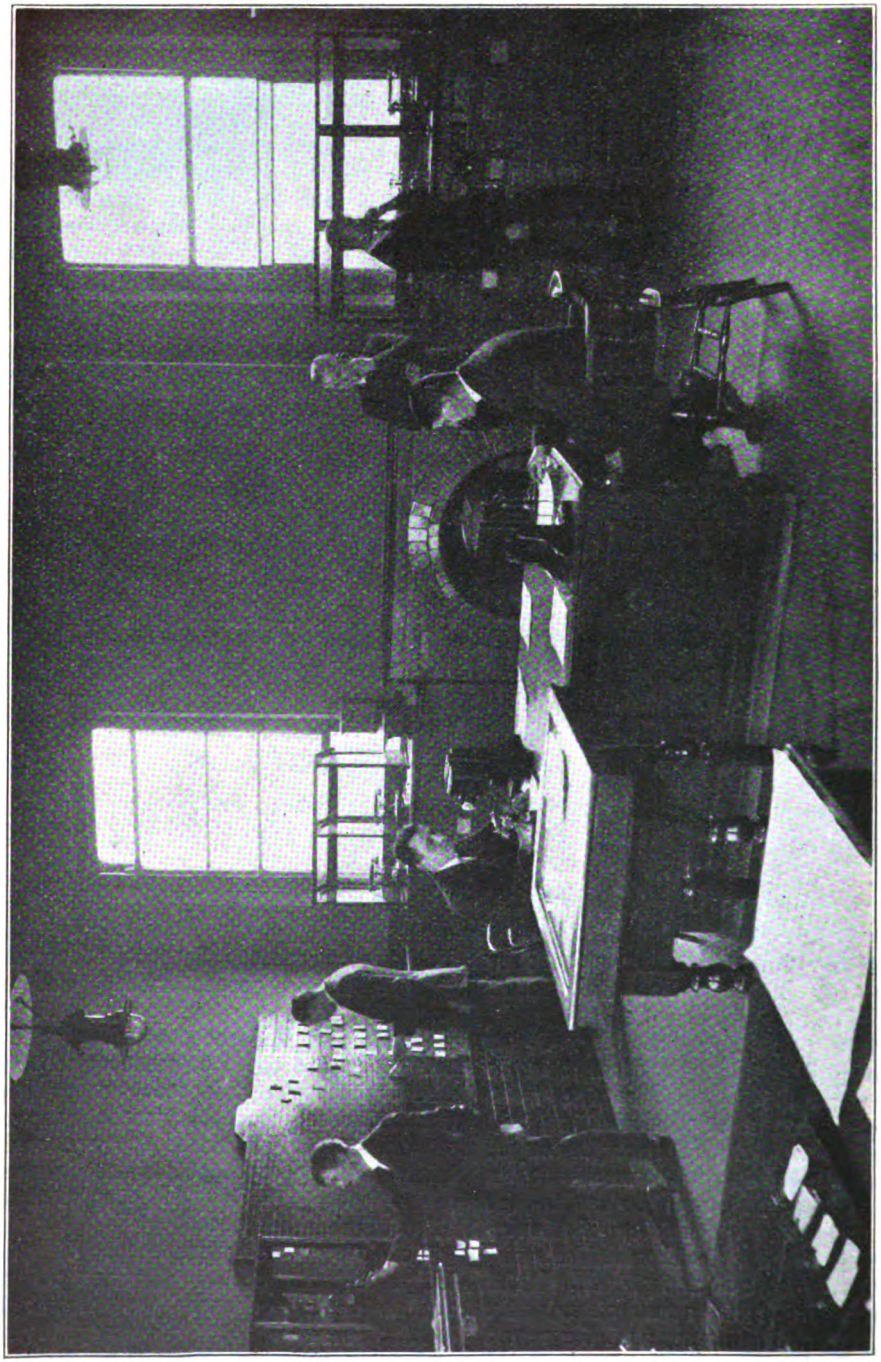

MASBORO' DISTRICT CONTROL OFFICE, SHOWING DAY STAFF ON DUTY.

Seated (right), Shift Controller: (left), Relief Assistant. *Standing* (left to right), Assistant (Rolling-Stock) and three Assistant Controllers (General).

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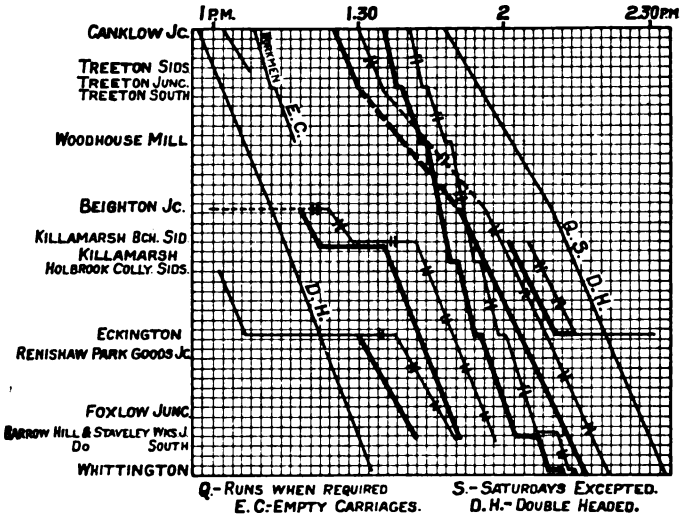
reference to the utilisation of line capacity to the maximum, and, in many cases, hitherto standard trains had their timings altered in order more suitably to work in with other timings. The necessity for great care in this connection will be obvious, for on a railway with a considerable mileage of quadruple track it is necessary, if best results are to be obtained, for fast and slow lines to be used with discrimination. The most effective working of goods trains, for example, sometimes requires them to run on the fast line between certain points, transfer to the slow line over a particular section in order to permit of the passage of an express train, and then for them to be returned to the fast line. This is quoted merely as an example, but it serves to emphasise the principle that, for the effective manipulation of traffic on a line of high density, all trains, other than express passenger bookings, must follow what may be called a sinuous path from starting-point to destination. The first essential in the arrangement of the services was to schedule the passenger trains and then follow with the important freight trains, ordinary freight trains and trip services. By plotting the trains on the diagrams in this order, advantage was taken of every opportunity of using the line to the maximum. In order to permit of future development without undue trouble, a number of special "paths" were also diagrammed where the conditions permitted this to be done.



SECTION OF CANKLOW JUNCTION-WHITTINGTON TRAIN DIAGRAM, SHOWING CHANGED PATHS.

In connection with this work the whole of the Midland Railway was mapped out in a series of line diagrams, enlargements of station lay-outs being superimposed to show the actual conditions more clearly. Slow lines are indicated in red, goods lines in green, while water troughs, cranes, tablet and staff stations are also distinctly shown. The principal gradients are given as well as the mileage in each direction. The system is divided into 42 sections (comprising a total mileage of 1,576) for this purpose.

As it was, of course, necessary that the operating staff should have full information as to the booked running of trains, the freight train working book on the Midland—a separate book deals with the passenger trains—is printed in different forms of type to indicate transfers from fast to slow, or goods lines, &c., while an ingenious system of train identification by means of distinctive symbols was originally used, but this has latterly been modified.

It was this "path" system (which is the keynote to traffic working on the Midland, and which receives careful consideration in each revision of train workings), coupled with the operating organisation adopted, that has led to the high degree of punctuality for which the Midland is famous. In subsequent articles, figures will be given to show the punctuality record of both passenger and freight trains, and, in the meantime, it may be added that road-van services, trip workings, pilot bookings and the like, are all given "paths" for the more effective performance of their allotted work.

Operating Organisation.

Two associated factors have contributed to the success of the Midland system. One is the convenient location of the

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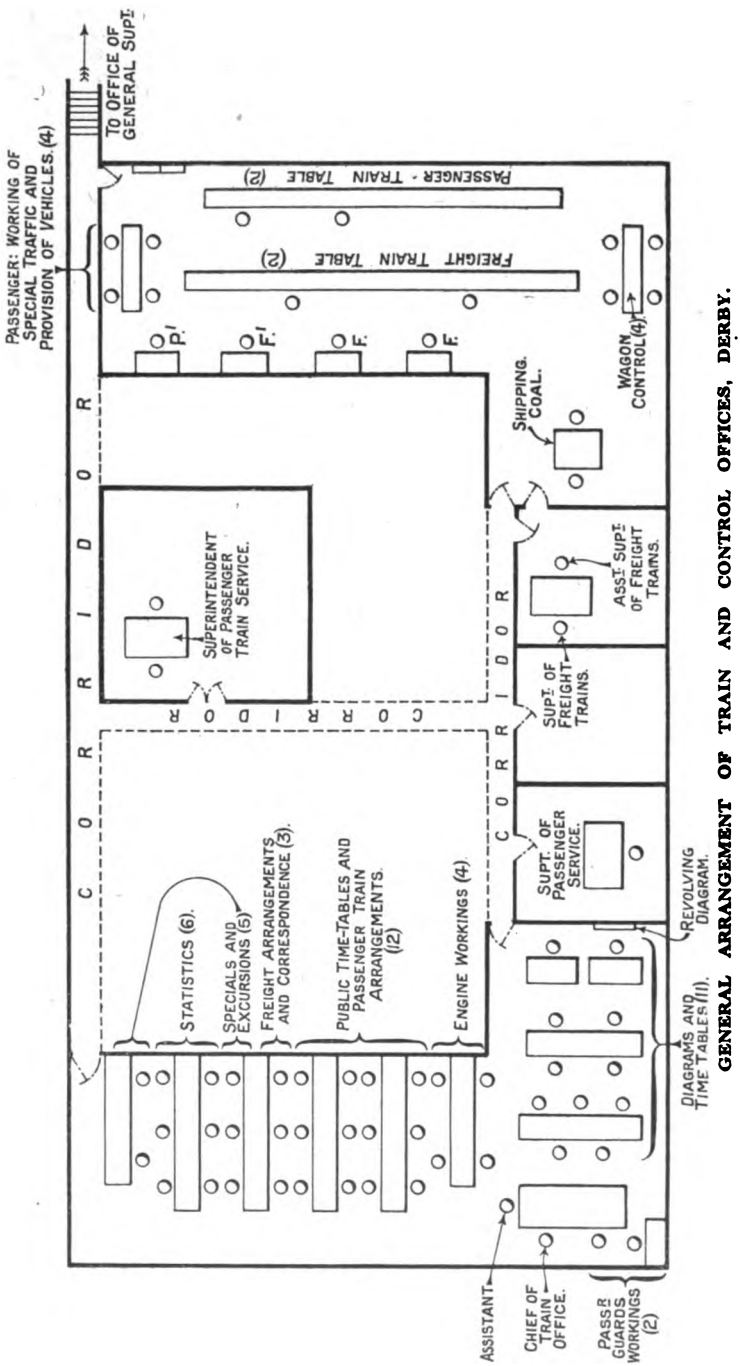
central control, this being admirably situated at Derby under the immediate supervision of the General Superintendent. Carlisle, 350 miles. Derby, the administrative headquarters and the location of the central control, is 129 miles from London, 141 from Bath and 179 from Carlisle. This general arrangement makes for facility of communication, and enables the supervising officers speedily to reach the more distant sections of the line.



GENERAL ARRANGEMENT OF TRAIN AND CONTROL OFFICES, DERBY.

The second factor is the form of the operating organisation. On the majority of British railways the responsibility for train-operating is divided between the Superintendent of the Line (aided by a number of District Traffic Officers) and the Chief Mechanical Engineer (usually through a Locomotive Running Superintendent), but in Midland practice the whole of the work is concentrated in the hands of a General Superintendent. This method of organisation dates from 1907, at the end of which year the department of the Superintendent of the Line was re-organised, and the whole operation of the line, including the control of locomotives and rolling-stock in service and other sections associated with traffic working, was brought within the scope of the then General Superintendent, Mr. Cecil Paget. An outline of the organisation is given in the chart on page 221.

Much controversy has raged from time to time as to the superworking by the traffic vision of engine department, and although there may be very sound arguments both for

The Midland system comprises 1,520 route-miles of line, the longest continuous stretch being from Shoeburyness to

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and against this procedure, there can be little doubt that under a scheme of traffic working based upon a centralised scheme of control, it is in the highest degree desirable that the whole of the work involved in the movement of trains should be in the hands of one department. Thus, under the immediate control of the General Superintendent, there is a Superintendent of Operation, a Superintendent of Motive Power, a Superintendent of Passenger Service, and General Passenger Agent.

The Superintendent of Operation has a staff which arranges the workings, and he is assisted by a Superintendent of Freight trains and a Superintendent of Passenger train service. The operating head of each district is the District Controller, whose position approximates to that of the more general District Traffic Officer except that he has no concern whatever with commercial affairs. On the other hand, he is definitely responsible to the General Superintendent for all train-operating within the confines of his district. It will therefore be seen that a District Controller on the Midland occupies a position very different from that of a Controller on a railway where the organisation includes District Traffic Officers working side by side with the control offices.

It really amounts to this. On the Midland all operating arrangements are centralised, and there is decentralised direct supervision in the shape of District Controllers. These officers, it should be added, are consulted by the Central Office before any changes affecting train operation in their districts are made, and are consequently able to exercise considerable influence in the framing of such arrangements. This vitiates the argument of those who object to centralised control because, as they allege, it is a policy of "spoon-feeding" which tends to destroy initiative.

THE TRAIN AND CONTROL OFFICES.

The Midland scheme of control is essentially a centralised one, and instructions relating to the whole of the workings, timings, engines in traffic and trainmen are issued from one office. The general arrangement both of the train and control offices is illustrated in the accompanying drawing on facing page.

It will be noticed that, while the train office is a large one, it is clearly divided into two sections to meet the requirements. Grouped at one end is the staff dealing with diagrams and time-tables, passenger guards' workings and engine workings, and towards the other end are the men engaged in connection with public time-tables and passenger train arrangements; freight arrangements and correspondence; specials and excursions; and statistics. The special point to be observed in this connection is that all those responsible in any way for work connected with train operation are brought together and are, consequently, able to make arrangements in conference without loss of time. Thus, the departments dealing with freight arrangements and passenger train arrangements make their demands upon the train office, and in this way the requirements are synchronised in order to effect best results.

BRAKE VAN, MIDLAND RAILWAY, SHOWING ORIGINAL SYMBOLS USED TO IDENTIFY TRAIN.

The central control office, shown on

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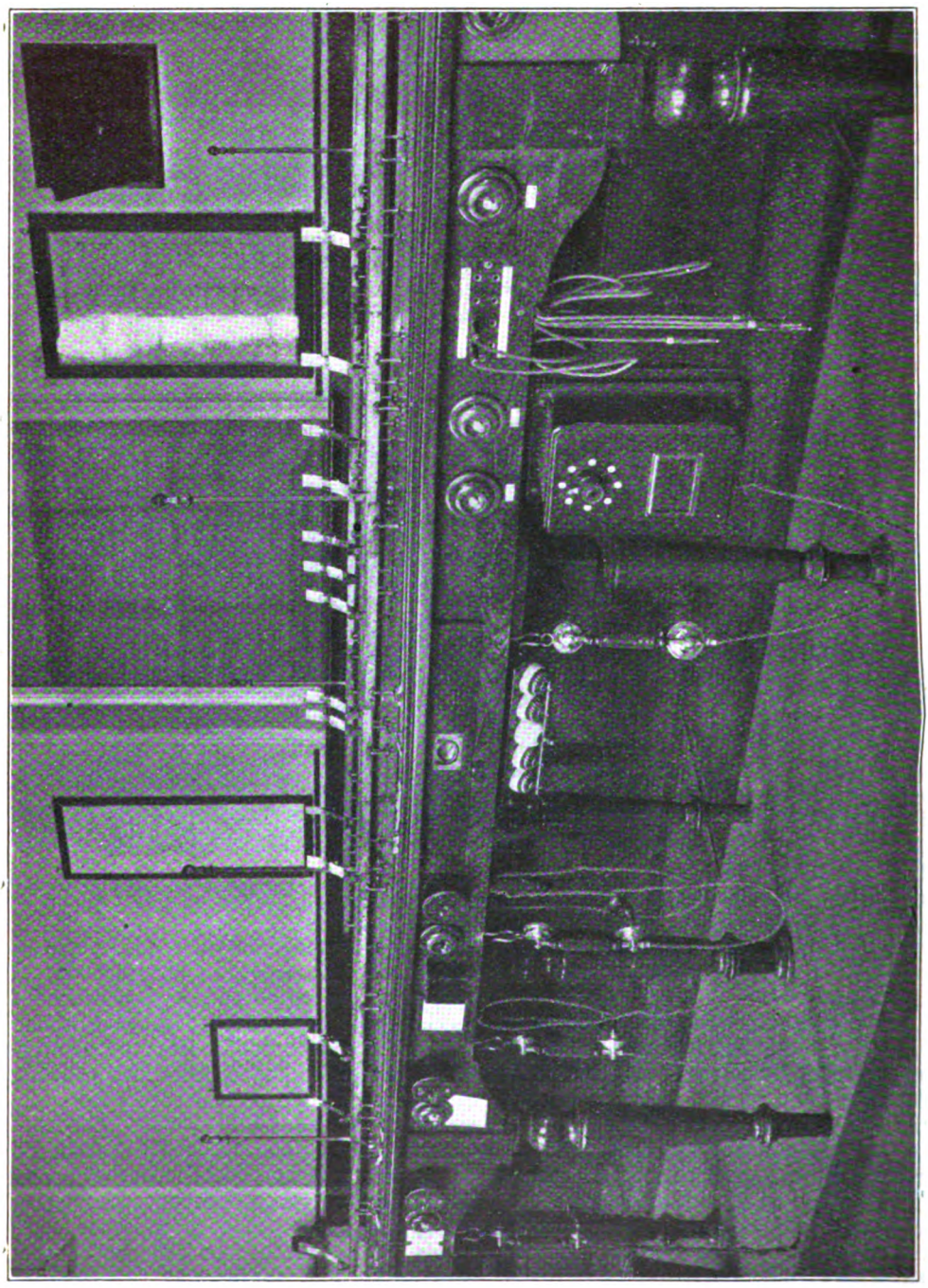

GENERAL VIEW OF PASSENGER TRAIN CONTROL TABLE, SHOWING TELEPHONIC EQUIPMENT AND ELECTRIC LIGHT CALLING INDICATIONS. CENTRAL CONTROL OFFICE, DERBY.

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the right of the drawing, has, as its most prominent feature, two long tables, one for freight trains and the other for passenger trains. In addition, at either end of the room is fitted a series of cabinets, one for use in connection with the working of special passenger traffic, and the provision of vehicles, and the other for the supply and distribution of freight rolling-stock. In the same office facilities are provided for the regulation of shipment coal traffic.

The work performed in the control office will be described in articles dealing with freight train operation and passenger train running respectively, and it will be sufficient here to say that, whereas the Midland central control continues to "move" passenger trains forward as they progress on their journey, they have now discarded the charting of freight trains at the central office. As will subsequently be noted, the trains are still "pegged up" in the district office, and the central office acts as a regulating and co-ordinating factor. This is a distinct advance upon any other scheme of control in this country, and illustrates the possibility of effecting economy in connection with control arrangements when the operating staff becomes thoroughly familiar with the new methods of working.

Such, in brief outline, is the organisation of the Midland Railway for traffic working supervision. The special points to be noted are :—

(1) Comprehensive supervisionary arrangements are conducted by a comparatively small staff.

(2) The workings of both express passenger and perishable trains and important freight trains are definitely controlled by the central office.

(3) The control system functions with a minimum amount of documentary work.

(4) Rolling-stock distribution (both passenger and freight) is included in the control scheme.

(5) Working of engines and duties of trainmen are arranged in the train and diagram office.

Daily Telephonic Conferences.

An outstanding feature in connection with the working of the Midland train control system is the arrangement whereby the Superintendent of Operation is able each morning to speak directly to all the district controllers at a series of telephonic conferences. They commence at 9 a.m. each day, and the different sections of the line are taken in turn. At this conference the general position of traffic working is discussed, and, if necessary, arrangements are agreed for the running of special trains with excess traffic—and for the cancellation of trains where this is practicable. Opportunity is also taken at this conference of discussing with the district controllers in a body any exceptional occurrences arising in the working of traffic in their respective areas the previous day, and explanations are required where there has been any unreasonable delay to trains. The controllers, for their part, are able to report any difficulty to headquarters, and as the neighbouring district controllers are also on the telephone, considerable advantage accrues.

Special Sunday working is also discussed in this way, with the result that each district controller knows exactly what arrangements are contemplated and what part, he, personally, will have to play. These daily conferences between the Central Control and the District Controls establish an equitable distribution of working difficulties and ensure harmony of effort. It is certain that the prompt discussion of traffic-working questions in this way must make for keen co-operative endeavour, and do much to smooth out the work of those who are aiming to make the Midland control still more efficient.

Road Van Services and Trip Workings.

As all those with practical knowledge of railway operating will be aware, delays are never so troublesome than when they are due to the ineffectual working of road van services and pilot trips. If arrangements for this work are not very definitely scheduled, there is always a degree of uncertainty tending to lead to unsatisfactory results.

At the beginning of their train control scheme, the Midland recognised this and foresaw that if road van services and trip workings were not definitely brought within the scope of the control, their irregularity might be the means of breaking down the new system of working.

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Accordingly, investigation was made into the traffic requirements of the roadside stations concerned in the road van services, and also in connection with the working of trip trains between depôts and collieries, exchange sidings, &c. In line could not be depended upon at certain times for the running of through trains. In order to improve this phase of operation consideration was given to a suggestion to concentrate roadside traffic at specific places selected with regard to the flow of

Passing times at places where trains run from slow or goods to fast or main lines are shown 10.20

Passing times at places where trains run from fast or main to slow or goods lines are shown 10.20

Starting or stopping times on main or fast lines are shown ... 10.20

Starting or stopping times on slow or goods lines are shown ... 10.20

Passing times on main or fast lines are shown 10.20

Passing times on slow or goods lines are shown 10.10

STATIONS.		Mineral to Rugby.	9.33 a.m. Mineral Tinshill to Branston.	Mineral to Peterboro' (Double headed).	Mineral to Wigston.	4.58 a.m. Mineral from Normanton.	10.14 a.m. Stopping Freight Leicester to Peterboro'.	Through Freight.	Mineral to Brent.	Mineral to Peterboro'.	10.45 a.m. Mineral Tinshill to Birmingham.	Mineral to Brent.	Mineral to Peterboro'.	Mineral to Leicester.	Mineral to Chaddesden.	Mineral to Brent.
		a.m.	a.m.	a.m.	a.m.	a.m.	a.m.	a.m. Tu. ex.	a.m.	a.m.	a.m.	p.m.	p.m.	p.m.	p.m. Tu. Ex.	p.m.
						W O				M O	S	S				
Derby Cattle Docks	dep.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Chaddesden South End	arr.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	dep.	..	..	..	..	..	..	10 35	..	..	..	..	..	..	..	..
Spondon Junction	pass	..	..	..	..	..	..	10 40	..	..	..	..	..	..	..	..
Sheet Stores	pass	..	..	..	..	..	..	11 0	..	..	..	..	..	..	..	..
Trent	pass	..	..	..	..	..	..	11 2	..	..	..	..	..	..	..	..
TOTON	dep.	10 25	10 29	10 30	10 60	10 55	..	..	11 5	11 6	11 30	12 15	12 30	12 45	1 0	1 8
Toton South Junction	pass	..	..	..	..	..	..	..	..	..	..	..	..	..	1 4	..
North Erewash Junction	pass	..	..	..	..	..	..	..	..	..	11 43	..	..	..	..	..
Trent	arr.	..	10*36	..	..	..	..	..	..	..	11*46	..	..	..	1*10	..
	dep.	..	10*46	..	..	..	..	..	..	..	11*53	..	..	..	1*14	..
Trent Junction	arr.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	dep.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ratcliffe Junction	arr.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	dep.	10 57	..	10 48	11 2	..	..	..	11 17	11 17	..	12 27	12 48	12 56	..	1 20
Kegworth	arr.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	dep.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Hathern	arr.	..	..	..	..	..	..	..	..	..	..	..	..	1 10	..	..
	dep.	..	..	..	..	..	..	..	..	..	..	..	..	1 40	..	1 34
Loughboro'	arr.	..	..	..	..	..	..	..	..	..	..	..	..	1 50	..	..
	dep.	10 59	..	11 13	11 34	..	..	..	11 39	11 39	..	12 47	1 4	2 10	..	1 44
Mount Sorrel	dep.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Sileby	arr.	..	..	..	..	..	..	..	..	..	..	..	..	2 25	..	..
	dep.	..	..	..	..	..	..	..	..	..	..	..	..	2 25	..	..
Syston North Junction	arr.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	dep.	11 21	..	11 34	11 46	..	..	..	12 1	12 1	..	1 10	1 26	2 34	..	2 2
Syston East Junction	arr.	..	..	..	..	..	11 18	..	..	..	..	1*12	..	..	..	..
	dep.	..	..	..	..	..	11 49	..	..	..	..	1*15	..	..	..	..

Toton South Jc. 11.7, Toton arr. 11.10.

SECTION OF MIDLAND RAILWAY FREIGHT TRAIN WORKING TIME BOOK.

the former case there were "pick-ups" running in both directions, and at irregular times delivering odd wagons and consignments of traffic at roadside stations. This irregular working had a detrimental effect on main line working, as the main traffic, and to deliver and collect such traffic by trains running in one direction only. To enable this to be done the time necessary for road van work at the stations was carefully calculated by a series of observation tests, and this led

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to adequate timings being given. Another point kept well in mind in designing the improved service was to ensure the minimum "crossing-over" of trains at roadside stations, and the position of each small yard or siding was, therefore, studied in relation to the proposed directional flow of the traffic.

The workings on the Midland were examined in sections in this manner, and after the passenger trains had been scheduled the roadside workings were definitely allocated to be worked in the up or down direction only, and arrangements were made for the traffic to be concentrated at certain selected points. This "directional" system necessarily involves a certain amount of over-carrying, but this does not mean the running of any additional trains, and, as it has the advantage of permitting more effective working and in some cases of enabling through wagons to be loaded at the concentration point, it has been found advantageous. The revised method of working also revealed the possibility of effecting improvements and economy in certain other directions, one being that, as the traffic for the roadside station was concentrated on specific trains, the cartage work at such stations was performed without the duplication entailed under the old method.

With regard to the trip working there were frequent cases of delay where trip trains had to traverse the main lines or pass over important junctions, while trains were waiting suitable margins, and, as it was obviously of importance that the trains should be run with reasonable punctuality under control conditions the question was thoroughly investigated. The general method adopted was to find the times most suitable for the trains to arrive at the junction and then build up the workings to suit. As a concrete example, the trip service between Beeston sidings and the collieries in the Nottingham area may be cited. Beeston sidings depot is situated on the Midland main line, and the junctions at Lenton North and Lenton South, over which the trip trains had to travel, carry a heavy passenger traffic—an average of 143 passenger trains per day being worked over the latter. Considerable delay frequently arose in "getting the road" under the old conditions, and after investigation it was decided to equalise the flow of traffic to and from the depôt and the collieries and to present the trip trains at Lenton South at times which did not clash with the passenger bookings. The service between Beeston sidings and the collieries was, therefore, reorganised with this object in view. The journey was divided into two definite stages, Beeston sidings—Radford (the station just beyond the junctions) and Radford—collieries, and a series of trips was booked to run in regular paths over each of these

M. R. Co. P. F. 1169. 6/12.

DERBY Station. Turn No. 28

Engine due to leave Loco. at 6.15 a.m. Days booked to work Monday to Saturday

Trip No.	Dep. time.	From	To	Arrival time.	Route via	Description of Train.	Loaded, Empty, L. & P. or E. & V.
1	6.30am	Derby	Melbourne	6.48	Chell-aston	Pass'r	Empty
2	7. 4am	Melbourne	Derby	7.26	"	"	Loaded
3	7.30am	Derby	Nottingham	8.13	Chaddn	"	"
4	9.12am	Nottingham	Chesterf'd	10.53	Long Eaton	"	"
5	12.24pm	Chesterf'd	Derby	1.25	Amber-gate.	"	"

"JOB" CARD ISSUED TO MIDLAND ENGINE DRIVERS.

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MIDLAND RAILWAY

The undermentioned Code for Rolling Stock, etc., must be used between Midland Stations only.

PASSENGER STOCK.

Bogie Compo.	A
" " (Corridor)	CA
" " (Lavatory)	CO
" " (Vestibule)	VC
" " Brake	BB
" " " (Corridor)	CD
" " " (Lavatory)	D
" First	L
" " (Corridor)	LC
" " (Vestibule)	VL
" " Brake (Corridor)	E
" Family Saloon	BFS
" " Sleeping Saloon	BFSS
" Third	F
" " (Corridor)	CF
" " (Lavatory)	C
" " (Vestibule)	VF
" " (with four Lavatory Compts.)	LVC
" " Brake	H
" " " (Corridor)	CH
" " " (Lavatory)	J
" " " (Vestibule)	VH
" " Saloon	BTS
Combination Coach	CC
Compo.	K
Covered Carriage Truck	CT
First Class Carriage	M
First Class Saloon	PS
Fish and Poultry Truck	FT
Guard's Van	R
Horse Box	HB
Hound Van	HV
Invalid Saloon	JD
Metro. Gauge Covered Carriage Truck	MCC
Milk and Fruit Van	P
Motor Van	MV
Open Carriage Truck (16 ft.)	CT
" " " (20 ft.)	LGT
Parcel Van	PA
Prize Cattle Van	PCV
Restaurant Car	RC
Sleeping Car	SR
Slip Carriage	SC
" " (Bogie)	SB
" " (Corridor)	CSS
Third	N
" (Lavatory)	LN
" Brake	G
" Class Picnic Car	LSN
" Saloon	TS
Van (Bogie)	S
" (Bogie Corridor)	CS
Steam Fitted	Y
Westinghouse	X

GOODS STOCK.

CATTLE.

Calf Van (Piped)	CC
Cattle Wagon, Medium	C
" " " (Piped)	PC
" " Large	CL
" " " (Piped)	PCL
" " Pat. Partition Fastener	PFC
Banana Van (Fully Fitted)	BX
" " " " & with stm. pipes	BXS
Fruit Van	SV
" (Piped)	PSV
Goods Van	V
" " (Piped)	PV
" " (Fully Fitted)	FV
Goods Wagon (Piped)	PG
" " (Fully Fitted)	FG
Low Goods Wagon	LG
Long Low Goods Wagon (8 tons)	LLF
" " " " (10 ")	LLH
Refrigerator Van	RV
" " (Piped)	PRV
" " (Fully Fitted)	FRV
Tariff Van	TV
" (Piped)	PTV
" " Brake	TH
" " " (Piped)	PTH
Ventilated Van	VV
" " (Piped)	PVV
" " (Fully Fitted)	FVV
Ventilated Meat Van	MT
" " " (Piped)	PMT
" " " (Fully Fitted)	FMT

GOODS.

Coke Wagon	CK
Double Bolster Truck	DBT
End Door Wagon (8 tons)	EDF
" " " (12 ")	EDK
High Side Coal or Goods Wagon (8 tons)	MF
" " " " " " (10 ")	MH
" " " " " " (12 ")	MK
Hopper Wagon	HP
Loco. Bunker Coal Wagon (6 tons)	LD
" Coal Wagon (8 tons)	LF
" " " (12 ")	LK
" " " (15 ")	LM
" " " (20 ")	LQ
" " " (30 ")	LS
Manure Wagon	MW
Rail Wagon, Long (12 tons, 31 feet)	RK
" " (15 tons, 25 feet)	RM
Sleeper Wagon	SW
Timber Truck (12 feet)	T
" " Long (15 feet)	LT

MINERAL, ETC.

Brake	B
Crane	CR
Sacks	SK
Sheets	ST
Timber Loaders	TL

SPECIAL WAGONS.

Armour Plate Truck (40 tons)	AP
" " " (50 ")	LAP
Bogie Rail Wagon (30 tons)	BRS
" " " (35 ")	BRX
" Tram Car Truck (15 tons)	BW
Boiler Truck or Trolley (15 ")	TYM
" " " " (18 ")	TYN
" " " " (18 tons) unrestricted	UTN
" " " " (25 ")	TYR
" " " " (30 ")	TYS
" " " " (30 ") long	LTS
" " " " (30 ") unrestricted	UTS
" " " " (40 ")	TYZ
" " " " (60 ")	TYY
Circular Plate Wagon (8 tons)	CP
Deep Case Wagon (5 tons)	DCB
" " " (8 ")	DCF
Flat Wagon (15 tons)	FM
" " (20 ")	FC
Flat Case Wagon (12 tons)	FCK
" " (15 ")	FCM
Girder Wagon (12 tons)	GWK
" " (15 ")	GWM
Glass Wagon (6 tons)	GL
" " (10 ")	GLN
Gun Truck (60 tons)	GT
" " (100 ")	LGT
Gunpowder Van	GP
Hollow Bolster Wagon (8 tons)	HBF
" " " (10 ")	HBM
" " " (15 ")	HBN
" " " (18 ")	HBH
Hot Armour Plate Truck (25 tons)	HAR
" " " (40 ")	HAZ
Implement Wagon (12 tons)	IPK
" " (12 ") unrestricted	UIK
" " (15 ")	IPM
" " (18 ")	IPN
" " (18 ") unrestricted	UIN
Iron Skeleton Wagon (6 tons)	ISW
Motor Car Van	W
Steam Fitted Van	SFV
Tank Wagon	TK
Traction Wagon (10 tons)	TRN
" " (12 ")	TRK
Tram Car Engine Truck (15 tons)	TEM
Wheel Wagon (6 tons)	WB
" " (18 ")	WH
Wood Skeleton Wagon (10 tons)	WS

CODE USED FOR IDENTIFICATION OF ROLLING-STOCK ON THE MIDLAND RAILWAY.

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stages. Trains hauling empties from Beeston were timed to exchange at Radford with the trains bringing coal traffic from the collieries to that point, and, as the regular running of these trains was insisted on, the exchange at Radford was effected with a limited use of siding accommodation. This method of working ensured promptitude and effected considerable improvement, definite paths being allotted to the trip workings, delays were reduced to a minimum, and as the trains ran at regular times the works and collieries obtained an increased and accelerated service.

Control Economics.

While opinion is by no means unanimous with regard to the advantages of train control when applied in a more or less partial form, it is now pretty generally agreed that where a properly centralised system of control can be introduced many operating advantages are to be obtained. The Midland have proved this to be the case, and below I am able to give some instructive figures showing the wonderful improvement in connection with the working since the introduction of central control.

The weekly average of delay during 1907 reached 21,869 hours, while this had decreased in 1913 to 7,749, these figures showing an improvement in the working during 1913 as compared with 1907 equal to 64 per cent. The figures for each year are given below :—

	Weekly average delay. Hours.
1907	21,869
1908	14,501
1909	11,680
1910	9,546
1911	8,959
1912	7,878
1913	7,749

A comparison of the freight train delays and the freight train receipts over the same period discloses the interesting fact that whereas in 1907 there was one hour's delay for every £7 8s. of freight traffic receipts, one hour's delay in 1913 worked out at £22 4s. of freight traffic receipts. These figures show that the adoption of a train control system led to great improvements in the working. The large saving thereby effected will be appreciated from the following comparative summary of the pre-control year of 1907 with 1913—the last normal year. In 1913 the tonnage carried was 50,500,300 tons, an increase of 3,237,000 tons over 1907; but in spite of that increase in tonnage the train-miles run were 1,650,000 less than in 1907, the delays to trains were less by 702,400 hours, and the coal consumed was less by 93,160 tons. The traffic receipts in 1913 were £13,297,000, an increase of £830,750 over 1907.

Space will not permit of further general development, but I would emphasise the fact that the Midland system is essentially a simple one, because it is my belief that its simplicity has had much to do with its success. Development to the present stage has been a gradual process, and additions to the arrangements have been effected on such a nicely graduated scale that there has been an entire absence of confusion. By thus eliminating the possibility of confusion, satisfactory results from the new methods were assured, while the way was paved to the present high standard of traffic operation on the Midland system. The increasing recognition that traffic working is a science requiring the most painstaking study and minute analysis for its success, must needs require in the future considerable extensions of the control principle, for this is the only method whereby those responsible for the manipulation of traffic are able to have a full and adequate knowledge of the conditions all over the line. And this is the primary requisite in the control of railway operations.

The successful working of the Midland system of train control is due mainly to four factors which may be summarised as follows :—(1) The intensive study of details as a preliminary to the reorganisations of the workings; (2) the concentration of operating arrangements including traffic, power and staff; (3) the skilful planning of the services; and (4) the general scheme of supervision, which reduces documentary record to a minimum and thus allows the maximum amount of initiative to those responsible for controlling train movements. Next month I hope to describe Midland methods of controlling freight train movement and to give figures and facts to show how greatly the Midland have benefited from their control working.

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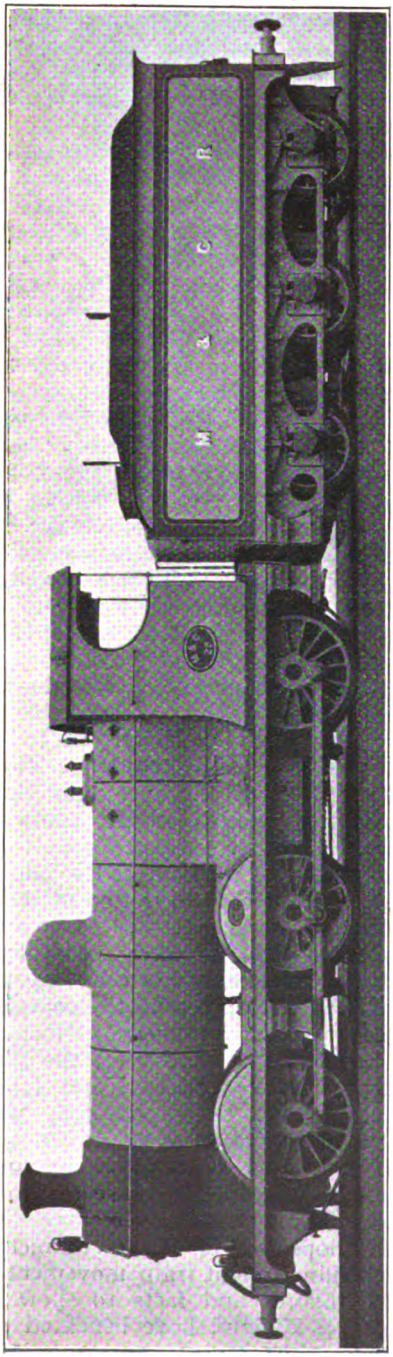
New Goods Locomotives, Maryport and Carlisle Railway.

Mr. J. B. ADAMSON, Locomotive Superintendent.



TWO new goods locomotives of the 0-6-0 type have recently been delivered to the Maryport and Carlisle Railway by the Yorkshire Engine Company, Limited. The engines were constructed at the Meadow Hall Works of this firm at Sheffield to the requirements and under the supervision of Mr. J. B. Adamson, the Locomotive Superintendent of the railway.

Saturated steam is used and the cylinders are 19 in. diam., with 26-in. stroke, the slide valves of balanced type, exhausting through the back, are situated above the cylinders. The valve gear is of the "Allan" straight link type. The coupled wheels are 5 ft. diam. and are spaced 7 ft. 9 in. and 9 ft. 3 in. apart, giving a total rigid wheelbase of 17 ft.

The working pressure is 170 lb. per sq. in. The boiler is 5 ft. diam. outside the largest ring and contains 245 brass tubes 1⅞ in. external diam. by 11 ft. 4¼ in. long between tube plates. The firebox shell is of round top type with direct roof stays and is 6 ft. 6 in. long. The heating surface of the tubes is 1,275 sq. ft., which together with 132 sq. ft. in the firebox gives a total of 1,407 sq. ft., the grate area being 19·6 sq. ft. Gravitation sanding is fitted to the leading and trailing wheels. The tender carries 3,500 gallons of water and 4 tons of coal.

The outside wheelbase of the engine and tender is 37 ft. 9¼ in. and the weight in working order is 49 tons 12 cwt. engine, and 39 tons 16 cwt. tender. The engine and tender are fitted with a steam brake acting upon all wheels in conjunction with the vacuum automatic brake for the train and are also equipped with steam heating fittings.

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Locomotive and Train Working in the latter part of the 19th Century.

THE FURNESS RAILWAY. [No. I.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

THE Furness Railway is unique in that the whole of its main line, from Carnforth to Whitehaven, closely follows the coast throughout. Barrow is its nodal point, but although the chicken (*i.e.*, the Furness Railway) was hatched in that town, it subsequently behaved for some 35 years in the coy manner of the well-known bird in the culinary fairy tale, and spent very much of its life in merely looking in at the kitchen door whilst the nice soup was being made. This, being interpreted more closely, means that, once upon a time (before 1882, to be exact), the old main line, over which the through passenger trains ran, made a short cut across the isthmus from a point a little distance west of Dalton Station to a junction with the main line to Whitehaven, some miles north of Barrow, which town was left on a branch siding. The old method of working was that the main line trains from Carnforth stopped at Dalton, where they were divided, a few carriages then proceeding to Barrow. At the same time another train came out from Barrow to Dalton, where it was attached to the Whitehaven coaches from Carnforth, and then the whole train travelled straight to Askam on its way to Whitehaven. A similar procedure in the reverse direction took place in the case of the trains from Whitehaven to Carnforth. Sometimes the connections were made at Furness Abbey instead.

Barrow did not appear to be of very great importance at that time; certainly not of such importance as it has since become, and it is only fair to add that the Furness Railway and Sir James Ramsden (at one time managing director) were responsible for the schemes which have made the town what it is.

"Minerals, not men," was the saying of George Stephenson when he made the North Midland Railway between Derby and Leeds, and took his line via Staveley instead of via Sheffield. In the same way, "Minerals, not men," was the leading idea of the promoters of the Furness Railway, who avoided Barrow. The minerals consist of hematite iron ore from the Dalton district and slates from Kirkby, and the original line, which was opened in 1846, consisted of that portion of the old main line which runs from Kirkby to Dalton, with a fork to Piel Pier, then the principal port of shipment. The extension to join the London & North Western Railway at Carnforth, known in its early days as the Ulverston & Lancaster Railway, was not made until 1857. Other extensions had also been made northward to Coniston, and in 1866 the company acquired the Whitehaven & Furness Junction Railway, which extended from Broughton northwards to the present terminus. Finally, in 1878, jointly with the London & North Western, the Furness Company took over a mineral line with a small amount of local passenger traffic, the Whitehaven, Cleator & Egremont Railway.

Piel Pier was apparently of much greater importance than it now is. In my younger days, when I saw much more of the Furness line than I have done for a considerable time, the Midland boat trains from Leeds and Bradford conveyed their through carriages, labelled "Barrow (Piel Pier)," and the morning train from Leeds at about 10.35 a.m. had a through carriage for Whitehaven in summer. I do not recollect through coaches prior to 1882 for the town of Barrow. But after a time the legend, "Barrow (Piel Pier)," disappeared from the Midland destination boards, and instead there appeared, "Barrow (Ramsden Dock)," and thenceforward Barrow put in a belated appearance in regard to through carriages. It may at once be stated that the Midland passenger traffic did not primarily cater for Barrow, the objective being the Isle of Man steamers. All the through

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carriages at this period consisted of six-wheeled Midland stock, and it was not until many years afterwards that Furness Railway stock alternated with that of the Midland to Bradford and Leeds. The through carriages date back many years, and were running to my knowledge in the 'seventies on my first journeys in Furness territory

The gradients on the main line are undulating, but not difficult, as is, perhaps, natural, seeing that the railway follows the coast nearly the whole way It is only where it begins to try the inland scenery that any troubles on this score arise, as, for instance, when the line, just before reaching Ulverston from Carnforth, begins to negotiate the short cut across the Barrow isthmus. Here the line rises to Lindal sidings somewhat steeply, the ruling gradient being 1 in 76, and varying over the worst section to 1 in 107, the whole length of the rise being about 3½ miles. Following this there is a considerable fall from Lindal sidings, past Furness Abbey to Roose (on the Barrow deviation), of which the worst is 1 in 63, though only for about 6 chains. Most of it is, however, sufficiently steep to be called severe for about 5 miles. The inland branch lines, especially the Coniston line, are distinctly hard.

At this stage let us travel to the Carnforth end of the line, and look into some of the Furness topography in that region. To the uninitiated Carnforth might appear to be a place of some importance, but, to be truthful, it must be said that it is hardly a place at all. It consists of two or three blast-furnaces, forming part of the local ironworks, a few rows of workmen's cottages, and a hostelry. It does not pretend to a casino, and no orchestra holds forth in a beautiful pavilion. When the wayfarer gets outside Carnforth station he shows great alacrity either in getting to the hills to the northward or in making a return bee-line for the station. But Carnforth makes up for all this in being an important railway junction of the first magnitude. The Furness line enters the station from the north-west, and on the south side makes a junction with the London & North Western main line. The Midland line from Skipton and Wennington also comes in from the north-west, and, in order to do so, describes a sort of contortion after the manner of a partial logarithmic spiral. The direction of the Midland approach is really from

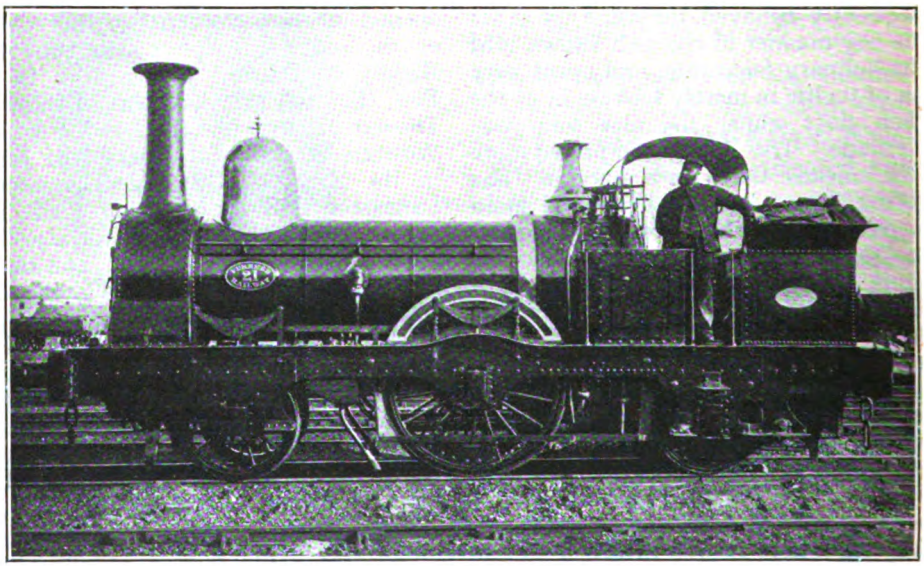

Photo.] [*Loco. Publishing Co. Ltd.*

OLD 2-2-2 TANK ENGINE No. 21.

Built by Sharp, Stewart & Co. Ltd., 1864. Driving wheels, 5 ft. 6 in. diam. Cylinders, 15 in. by 20 in.

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the east, but, first of all, it makes a dive to the south-west, then swings westward and crosses the London & North Western main line by an overbridge about half a mile north of the station, and finally describes a picturesque and beautiful spiral, after the manner of a descending aeroplane, to enter the station from the opposite direction to that in which it was travelling two minutes before. At the point where it begins to describe the curve into the station there is a junction and signalbox known as Carnforth East Junction (officially known as Carnforth F. and M. J.), from which a direct line goes straight on in a westward direction and joins the Furness main line to Barrow. Only the goods and mineral traffic between the Furness and the Midland now passes over this direct line, but, before the war, certain express and excursion trains to the Lake District from Leeds and Bradford also used the direct road without entering Carnforth Station.

So far I have been writing of the Wennington and Carnforth line as Midland property, but, as a matter of fact, it is a line belonging jointly to the Midland and Furness Railways. The Midland, however, work practically the whole of the trains over it—passenger, goods and mineral. The Furness share of the working partnership is the task of maintaining the line and buildings in good repair, and their one train and engine to be seen on it as far as Wennington is the ballast train in charge of one of the older 0-6-0 goods engines. Whether the Furness Railway has occasionally worked other trains over it I am unable to say from personal knowledge, but during my many journeys over it in former years I never came across anything but the forlorn ballast train.

Near Carnforth East Junction there is an engine shed of considerable size, where the Midland quarters about 25 engines. Of these, six or seven are fast passenger engines, and the remainder work the mineral and goods traffic. All these engines are for the purpose of taking traffic between the Furness line and Leeds and Bradford, though most of the mineral trains, of which there is a very large number of great weight, run to Leeds and Sheffield. The engine shed is, I have been informed, really a joint one, though the Furness stables its engines in its own shed close to Carnforth Station.

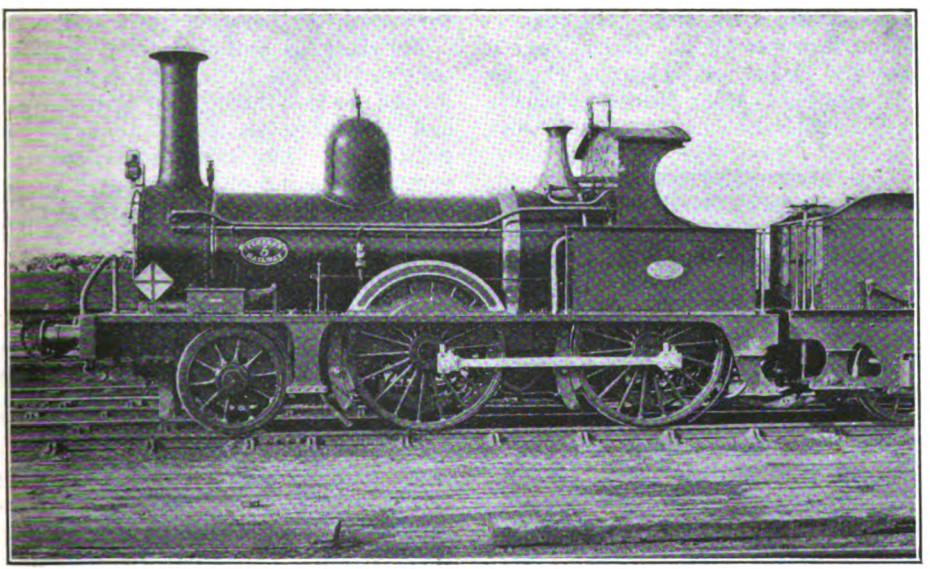

Photo.] [*Loco. Publishing Co. Ltd.*

2-4-0 PASSENGER LOCOMOTIVE No. 5.

Built by Sharp, Stewart & Co. Ltd. Coupled wheels, 5 ft. 6 in. diam. Cylinders, 16 in. by 20 in.

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All goods and mineral trains change engines at the east junction box, the Furness engine coming off and the Midland taking its place, and the same used to take place with the excursion trains in the palmy days before a benevolent Government thought fit to stop them. The fastest Midland expresses also stopped at the east junction, the Midland engine taking two or three coaches into Carnforth Station and the main portion of the train then travelled direct from the East Junction to Barrow in charge of a Furness engine without entering the station.

The principal Furness locomotive sheds were at Carnforth, Barrow, Whitehaven, and Moor Row, at all of which, except the last, the main line passenger engines were distributed. Moor Row was mostly devoted to the tank engines, which work mineral trains from the Cleator centre. There were also small sheds at Lake Side (Windermere) and Coniston for the respective branches, though only one or two engines were stabled in each.

Coming now to the locomotives as they existed in 1880, the outstanding feature of the stock was that not a single engine had been built to the company's own designs; in fact, it was not until Mr. Pettigrew put his first engines on the line in 1898 that the Furness Railway may be said to have possessed such a thing. For 50 years the company accepted engines designed by the manufacturers, and, it must be admitted, apparently survived the process. From 1846 to 1861, when the number of engines had slowly increased to 16 only, there were examples by Bury, Fairbairn and Sharp, mostly of the four-wheeled type, but, after 1861, the whole of the locomotive stock until 1898 came from the works of Messrs. Sharp, Stewart & Co., Limited.

The main line passenger traffic was entirely in the hands of 19 small 2-4-0 engines, the first of which came out in 1870. These engines had inside cylinders, 16 in. by 20 in., and the framing was inside throughout. The coupled wheels were 5 ft. 6 in. diam., and the total heating surface was 910½ sq. ft., of which the firebox contributed 71 sq. ft. The pressure was only 120 lb., and the total weight in working order 30¼ tons. The tenders had only four wheels and had a capacity of 1,200 gallons of water. These 17 engines were :—

1870 ...	Nos. 1, 2, 57, 58.
1872 ...	,, 70 to 75, 46 to 48.
1873 ...	,, 5, 6, 11 and 12.

Two more, Nos. 44 and 45, were addear in 1882, making a total of 19 of the class to which were distributed between Carnforth, Barrow and Whitehaven sheds.

The Furness line was not, however, the first railway to possess engines of this class, for, in reality, the design dates back to 1863, when Sharp, Stewart & Co. first began to supply exactly similar engines to the Cambrian Railways, for which line they built 12 between 1863 and 1866.

For their size and power they apparently were satisfactory little engines, and sufficed for the needs of the Furness Railway, which had no other passenger tender engines until 1890. The train loads during the summer months often consisted of 10 or 12 four and six-wheeled coaches, but the speeds were far from meteoric, as might be expected.

There was one other type of passenger engine, a class of pretty little well-tank engines, with polished brass domes placed close to the chimneys. These had "single" driving wheels, 5 ft. 6 in. in diam., cylinders 15 in. by 18 in., and double frames. The total heating surface was 858 sq. ft., and they carried 120 lb. pressure. Their total weight was 30¼ tons in working order, of which 11¾ tons were carried on the driving wheels. Originally there had been 10 of these single-driver tank engines, but three of the earlier and somewhat smaller ones had been broken up, and there were seven still in service in 1880. Before the coupled tender engines were built in 1870 they were the only passenger engines on the line except three still smaller specimens of a similar type which ran in the Whitehaven district. How the Furness Railway managed to work its passenger traffic between Carnforth and Whitehaven with this band of pretty little ragamuffins I do not know, but it must have been done somehow, and I suppose care was taken not to overload them.

The seven engines which I remember well were Nos. 12A (1857), Nos. 21 and 22 (1864), and Nos. 34 to 37 (1866), all by Sharp, Stewart & Co., and, to do both the

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firm and the "ragamuffins" justice, they were really nice little engines. After they had departed from the main line, they were put to work on the branches, and attained a somewhat surprising longevity. Three or four of them, including Nos. 12A, 21 and 35, were for many years at Carnforth, and only disappeared from there during the years 1896–1898. They were employed in working over a line which I have not hitherto mentioned. If the reader will examine a map of the district, he will find a loop line which runs in a north-easterly direction from Arnside to Wincaster Junction, the Ulverston and Windermere branch, and were superseded about 1891 by the converted 2-4-2 tank engines to be mentioned later.

No. 12A was the evergreen veteran of the lot, and must have spent very many years at Carnforth, for on the occasion of my various visits to the engine shed there from 1882 onwards it was always the first engine to be seen there. I very much doubt whether it ever had a new boiler, though I do not know this definitely, but at all events its outward appearance was not altered. And in 1898, after more than 40 years' service on the Furness

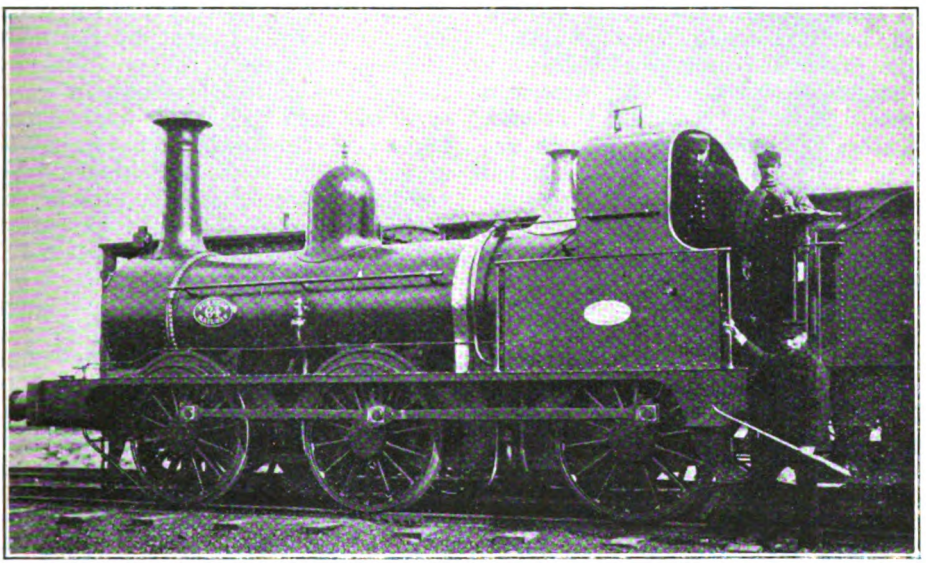

Photo.] [*Loco. Publishing Co. Ltd.*

0 6-0 GOODS LOCOMOTIVE No. 64.

Built by Sharp, Stewart & Co. Ltd. Coupled wheels, 4 ft. 6 in. diam. Cylinders, 16 in. by 24 in.

a point about a mile south of Oxenholme on the London and North Western main line to Carlisle. This loop, as far as Wincaster Junction, belongs to the Furness Railway, and a service of trains has been worked for many years between Grange and Kendal, to which town the company has running powers over the London and North Western line. The "single driver" tank engines stabled at Carnforth were for a long period used for this service. During the "seventies" and "eighties" one or two of the same class were stationed at Lake Side to work

Railway, No. 12A was sold (together with 35A of the same type) to the Weston-super-Mare, Clevedon and Portishead Light Railway, who got several years more service out of it Eventually, just about the time when 12A was celebrating a golden jubilee, the Weston-super-Mare, Clevedon and Portishead people had a lapse, and in an absent-minded way disposed of the engine, so that its place on the iron road knew it no more.

Reminiscences of old 12A bring up in my mind the longevity of a number of former locomotive boilers made of best

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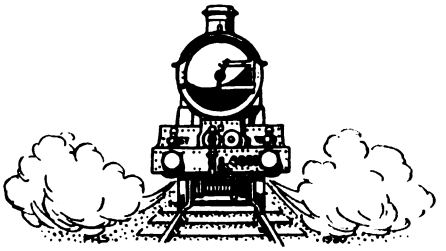
Low Moor or Farnley iron. Although Sir William Siemens spoke very slightingly of wrought iron as a "sandwich of iron and dirt," I very much doubt whether any steel boilers have as yet succeeded in lasting so long under average working conditions as did a considerable number of the "iron and dirt" variety." I do not mean by this to recommend a return to wrought-iron boilers; to begin with they are too expensive, apart from other reasons why steel is preferable. According to the theory of electrical boiler corrosion due to dissimilar metals, the old boilers should not have lasted very long, seeing that the tubes were of brass or copper composition. The theory is right enough, but occasionally "gangs agley" and the practical results are not always what might be expected. An American humorist, probably Mark Twain, once told a story of a good little boy who was going to Sunday school, when a tile fell off a roof and damaged him considerably. A bad little boy, on the other hand, instead of going to Sunday school went skating, but he did not fall into the pond and nothing happened to him. Of course, this should not have been the case, but so it was with many of the old Low Moor boilers with the brass tubes. According to the theory there should have been enough corrosion, due to galvanic agency, to have finished such boilers in a very short time, nevertheless many of them stood the racket for 25 to 30 years. However I appear to be "jumping the points," so before leaving the road entirely I had better get back to the Furness engines and discuss the electric happenings in the inside of a boiler on another more suitable occasion.

A peculiarity of the Furness mineral and goods locomotives was that for 20 years, until 1866, there was not a six-wheeled engine on the line. The whole traffic was conducted by 0-4-0 engines, of which there was a large variety. The Bury engines, Nos. 3 and 4, of which No. 3 was celebrated as "Old Copper Nob," were so well known that they hardly require description. Both of them worked continuously from 1846 until 1900, when No. 4 was scrapped and No. 3 placed in a position of honour, which it thoroughly deserved, on a pedestal at Barrow station. These engines had 4 ft. 9 in. coupled wheels, and 15 in. by 24 in. cylinders. The total heating surface was 854 sq. ft., of which 805 sq. ft. were tube surface, and 49 sq. ft. were provided by the firebox. The pressure was 110 lb. per sq. inch, and the total weight of the engine in working order was 19½ tons. There were also eight four-wheeled engines with bar frames built in 1854-61 by William Fairbairn & Sons, and these also had the Bury type of "hay-stack" firebox. The eight four-wheeled mineral engines by Sharp, Stewart & Co., 1863-6, had plate frames.

The standard 0-6-0 goods and mineral engines of the period 1866 to 1884 were of Sharp, Stewart's "Cambrian" design, and had been standard on that line from 1861. There were altogether 53 of the class on the Furness Railway, including the last two engines of 1884. They were small engines with 16 in. by 24 in. cylinders, and 4 ft. 6 in. wheels. They carried a pressure of 120 lb. per square inch, and had a total heating surface of 959¼ sq. ft. The total weight in working order was nearly 31 tons. One of them, No. 64, is illustrated on page 237.

(To be continued.)



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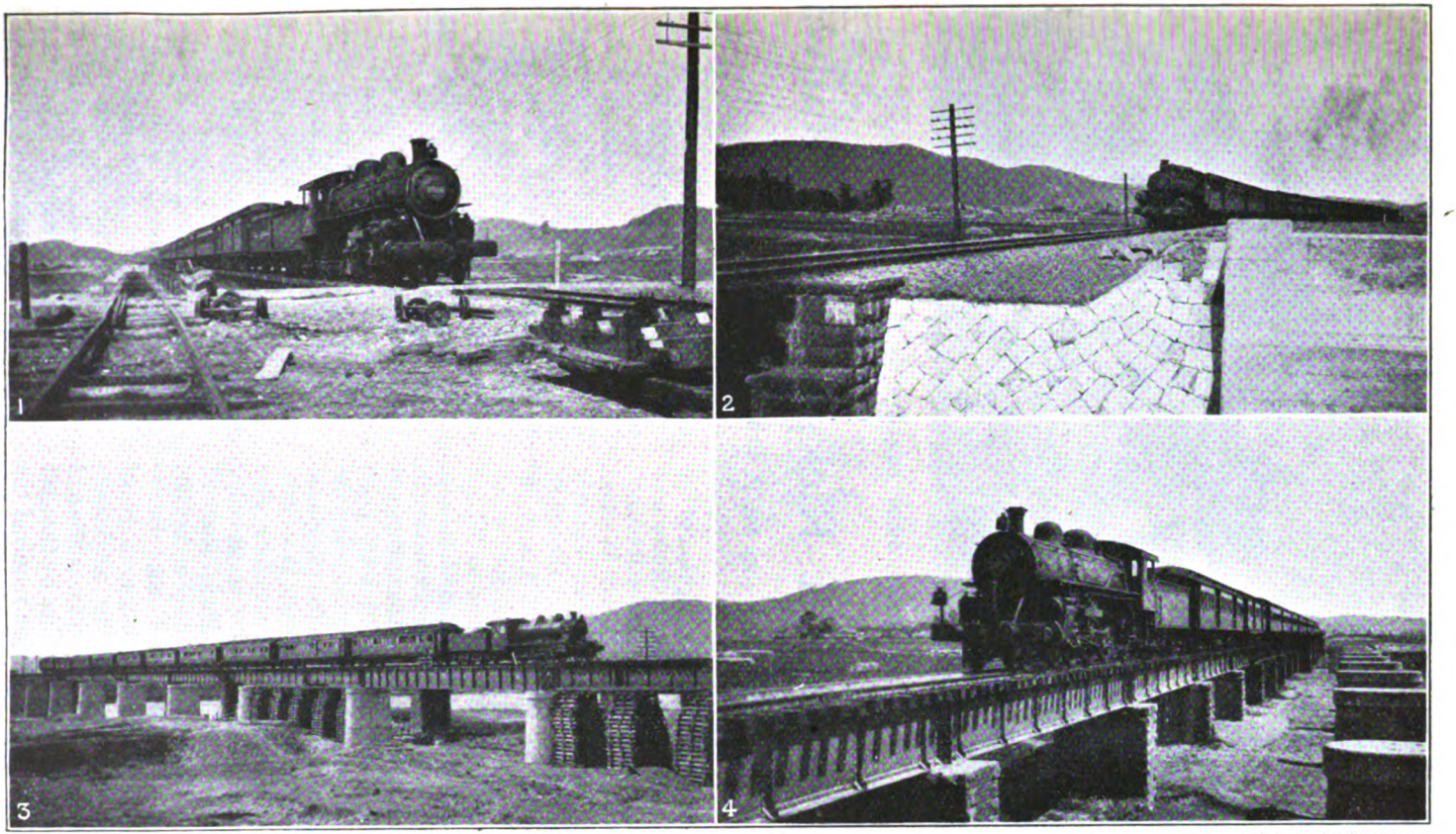

Photographed near Okayama] *[by A. de Q. Mears.*

JAPANESE RAILWAY TRAINS.

1. Itozaki-Tokyo Semi-fast.
2. Kyoto-Yanizu Semi-fast.
3. Yanizu-Kyoto Semi-fast on Asaki Bridge.
4. Tokyo-Shimono seki Third Class Express.

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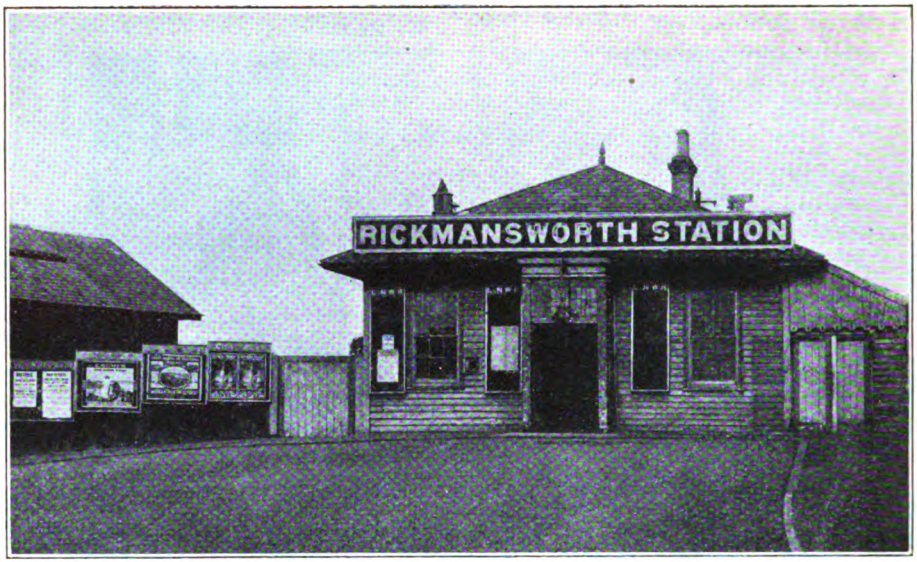

RICKMANSWORTH STATION, L. & N.W.R.

The Watford & Rickmansworth Railway.

By W. E. EDWARDS.

SUCH was the official description of the four and a half mile railway now forming the Rickmansworth branch of the London and North Western Railway system, originally an entirely private enterprise, of which the chief promoter was the First Lord Ebury, of Moor Park, Rickmansworth, for which reason its old local designation as "Lord Ebury's line," is still remembered.

Under the Watford and Rickmansworth Railway Act of July 3, 1860, the authorised capital was £40,000, divided into 4,000 £10 shares, the board of directors being the Rt. Hon. Lord Ebury, Rt. Hon. Reginald Capel (then of Little Cassiobury, Watford), and the Hon. Robert W. Grosvenor; also Ralph Etwall, Isaac Warwick (Croxley Green), Joseph Cary (Moor Park), Richard Arabin, and Herbert Ingram (Loudwater, Rickmansworth), Esquires; the directorate thus consisting almost entirely of well known landowners in the neighbourhood. A period of four years was allowed for the completion of the line by the Act noted, and another condition required the company to "maintain for ever thereafter a good and substantial bridge over the Grand Junction canal and towing path, with a soffit at least 10 ft. over the top water level."

But little time was lost at the outset, as it is related that within three weeks of the granting of the Royal Assent to the Bill "certain flag staffs were observed" in Watford, "pourtraying the probable course of the line," also that "other paraphernalia, animate and inanimate, in the surveying line, have been in requisition." The most interesting event in the early history of the line, however, was a ceremony enacted on Thursday, November 22, 1860, within a field appertaining to Tolpits Farm, and closely adjoining the Moor Park level crossing (1½ miles from Rickmansworth Station) still existent to-day.

There the first sod of the new line was, appropriately enough, cut by Lord Ebury himself, and a description of the surroundings, as then furnished, but applying, in great measure to-day, ran as follows:

"Although November, it was warm, the green slopes of Cassiobury rising from the Valley of the Gade and Colne as brilliant as a summer's day. Here are cultivated

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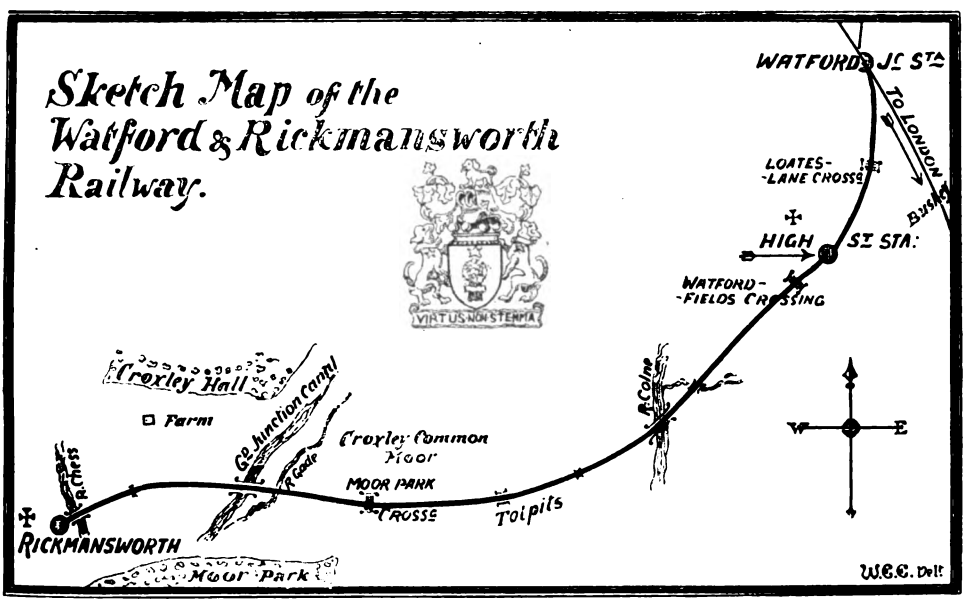
fields, ploughed and harrowed, and then pieces of pasture, the whole belted with trees. Yonder the mill at Croxley Green, whose sails reflecting sunbeams, stand out vivid from a background of black clouds. The sunlight plays upon the umbrageous shades of Moor Park, lights up the spire of Rickmansworth Church, and sheds glory upon every object."

Among the assembled company were Lord and Lady Grosvenor, Earl Verulam, Lord and Lady Maldon, Hon. Reginald and Mrs. Capel, Rev. A. H. Barker, Vicar of Rickmansworth, Mr. and Mrs. Warwick, Mr. Dean and Capt. Creed (London and North Western directors), with Mr. J. S. Pierce, that company's engineer. A prayer invoking the divine blessing upon the undertaking, was offered by the Vicar of Rickmansworth.

After the accustomed manipulation of a spade (presented by the contractor, Mr. Hattesley) and the wheeling of a barrow, Lord Ebury remarked that "the great railways had made cross-country travelling impossible, there were no coaches, and their places were not yet supplied by branch railways. The new line would bring them nearer Hertford, and he hoped Lord Verulam would support the proposed communication with Hatfield . . . that day's ceremony was of little importance if only a line from Rickmansworth to Watford was intended, although he would support it, but his most hearty co-operation would be given to a line which also went to Uxbridge." As the reader is aware, the latter scheme never materialised, although it is interesting to note that, at a later date, Lord Ebury actually "cut the first sod," in view of the Uxbridge extension from Rickmansworth.

It is next related that the company rejoined their carriages and drove to Rickmansworth to the strains of "The Roast Beef of Old England," by the Watford Band. There, at the (present) National Schools, 100 guests were entertained at a *déjeuner* provided from the



Swan Hotel by Mr. Cudworth. In presiding, Lord Ebury suggested that perhaps the toast next that of the Sovereign should be "the Army and the Navvies," but the usual formula, viz.—"Army, Navy and Volunteers" was finally adopted. The first corps of rifle volunteers, it may be noted, had recently been formed in Watford.

"Although," Lord Ebury added, "he had shared in the general objection to railways, he had now overcome them, but he knew of one gentleman near Rickmansworth who would never enter a train." Mr. Isaac Warwick proposed the healths of the London and North Western and Great Western directors.

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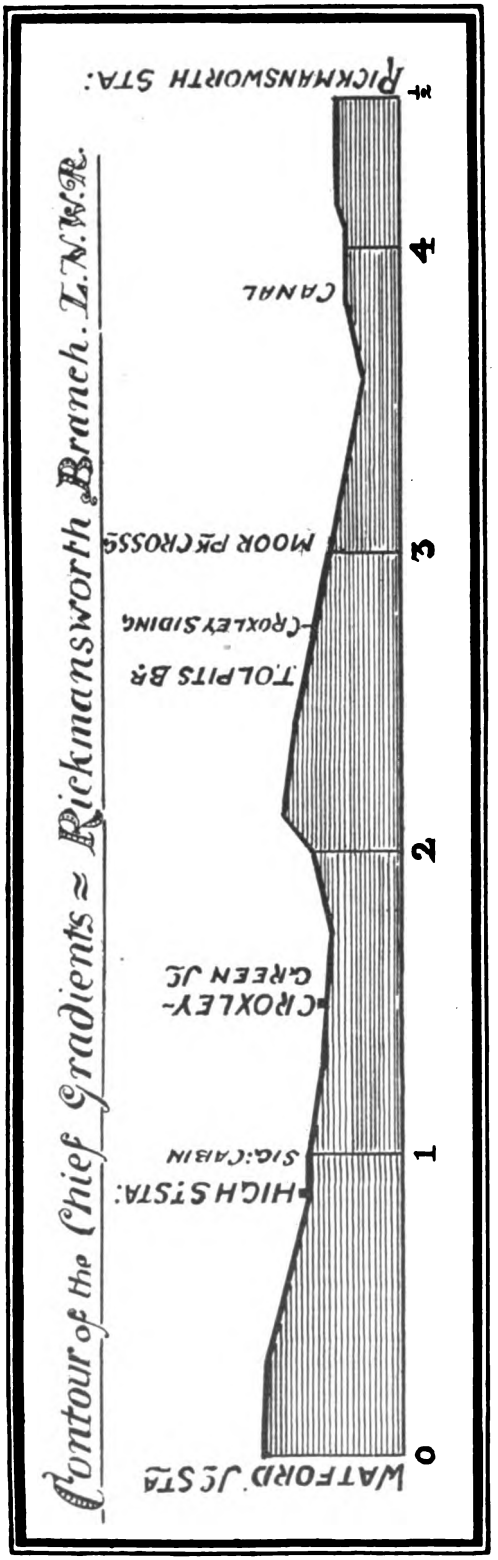


Responding for the former, Captain Creed congratulated the Watford and Rickmansworth shareholders in retaining their line, "it had more chance of success than if taken up by the London and North Western Railway, which had thirty millions in capital and 900 miles of rail, so that local requirements were best undertaken by those of the neighbourhood." A letter of apology was read from Lord Shelbourne, the Great Western Railway chairman, whose directors, it was stated, "were most anxious to promote the line."

In responding to the toast of the "Bishop and Clergy," the Vicar of Rickmansworth said that "he recollected the time when the attempt to make a railway was regarded as an attack by an invading force, and watchers were employed to keep off the surveyors. To-day's ceremony was, he thought, Christian in character, for the railways brought into country districts men who, being orderly and disciplined, steady and punctual, necessarily set an example to those around." This toast, it is recorded, was accompanied by the musical rendering of the "Railway Gallop." Next the solicitor, contractor and navvies were similarly honoured to the strains of "Cheer, boys, cheer," and finally those of "A fine old English Gentleman" enlivened the toast of "Lord Ebury and the landowners."

On September 23, 1862, the fifth annual meeting of the Watford and Rickmansworth Railway Company was held at the Westminster Palace Hotel, Lord Ebury presiding. It was announced that "the line was (then) complete, and arrangements perfected for being worked by the London and North Western Railway." An agreement was prepared and under consideration by the Great Western Railway, under which "that company would subscribe the capital and work the Uxbridge and Rickmansworth Railway." An act for an extension to Chesham had also been sanctioned by Parliament, by which the London and North Western Railway took powers to subscribe £30,000. A further Act was obtained for completing the communication between St. Albans and Hatfield, towards which the Great Northern Railway would subscribe £20,000. "These lines," it was stated, "will open a large amount of through traffic which cannot fail to find its way on to the Wat-

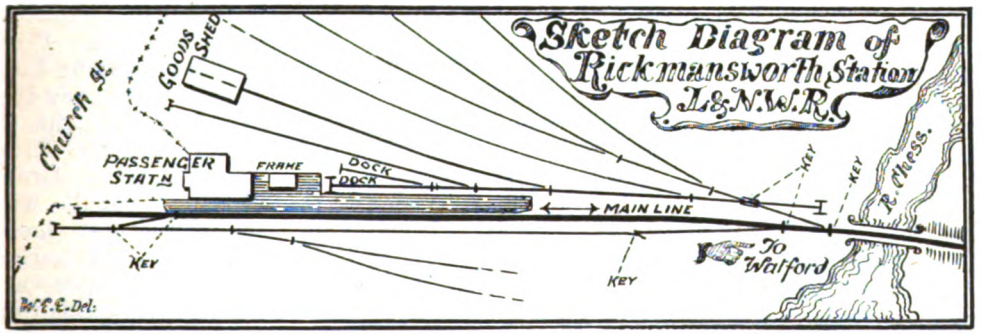
ford and Rickmansworth line." It was thus anticipated that a "continuous communication" would exist over the local line between "the four great main lines north of the Thames."

In connection with the working arrangements agreed upon, and already alluded to, it is interesting to notice that Mr. G. P. Neele had been appointed, in March, 1862, as the first (outdoor) superintendent of the London Division of the London and North Western Railway, and that gentleman recounts his pleasant interviews with Lord Ebury with a view to such arrangements.

Watford High Street, many readers are aware, is the only intermediate station upon the Rickmansworth line, and amongst the premises which disappeared in the process of its construction were those of Mr. Peacock, whose descendants occupy, in journalism, a leading position in West

An "excellent dinner," it is recorded, was given by the Rt. Hon. Lord Ebury to 150 mechanics, labourers and others engaged in the construction of the line, at the Queen's Arms, Watford, whilst an editorial reference to the event thus concluded:—"May his lordship live long enough to see the good realised which we venture to predict, and of which he has been the author, and those who may come after him will seldom err if they endeavour to follow the example shown them by their illustrious and noble parent."

The line from Watford to Rickmansworth was single throughout, so continuing until the recent developments, a single faced platform, on what is now the up side, sufficing at High Street station. It may prove of interest here to remind readers that the first signal repeater used in this country, so it is stated, combined



Herts to-day. We are told that "when the first engine came down the line to the bottom of the town it caused quite a commotion, and hundreds of inhabitants, including persons from Bushey, Aldenham and Rickmansworth, came to see the wondrous sight."

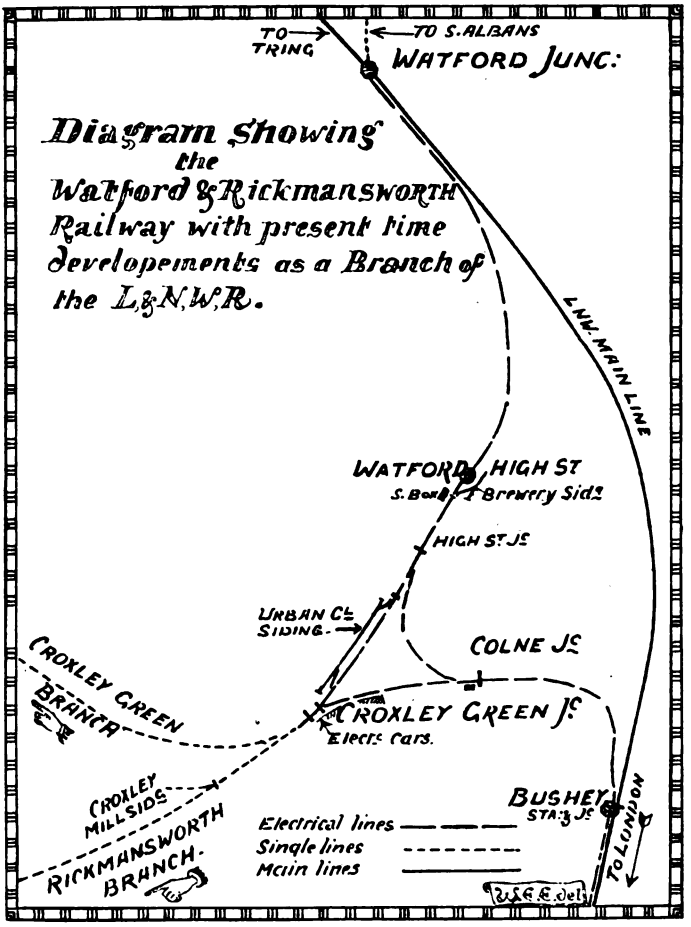
The formal opening of the railway, although without public ceremonial, took place on Wednesday, October 1, 1862, with the following passenger service, on week-days only.

Leaving Watford.	Leaving Rickmansworth.
8.30	9.15
9.40	10.30
3.10	3.30
4.0	4.20
5.55	6.40

	s.	d.
1st class (single fare)	1	0
2nd ,, ,, ...	0	8
3rd ,, ,, ...	0	6½
1st class (return)	1	6
2nd ,, ...	1	0

with a "light out" indicator, was brought into use at about this time at High Street. See RAILWAY MAGAZINE, Vol. xxix, p. 398.

Leaving Watford Junction at the main line level, viz., falling at 1 in 405 towards London, a sharp descent, originating northward of the former Loates Lane crossing, ends at 1 in 84 at High Street bridge, seven-eighths of a mile from the junction, and at a level of about 38 ft. below it. Next is a short up gradient and a level stretch as far as the 1-mile post (opposite High Street Cabin) followed by a fall of 1 in 260, lessening to 1 in 1,730 near the present electric car sheds, and continuing past the Cloxley Green Junction. Before the second mile post is reached (near which the Colne is crossed) a rise of 1 in 110 sets in, increasing to an angle of 80 at the summit near Tolpits, when a fall of 1 in 775, increasing, near the third mile post, to that of 1 in 75 past



the Moor Park level crossing. The descent then decreases to 1 in 580, followed by an abrupt ascent of 1 in 80, near the 3½ mile post, and just after dipping under the younger, by a quarter century, Metropolitan and Great Central Joint Line, which intersects at a higher level. Next the Grand Junction Canal is crossed, at a level gradient, by the bridge prescribed by the Authorising Act. The remainder of the branch is more or less level, despite frequent changes of gradient, including a short incline at 1 in 154 as Rickmansworth is approached.

The rail motor system is now adopted in the case of the passenger service, the single line section between Croxley Green Junction and Rickmansworth being at present worked under train staff regulations, one train, or engine, only being permitted upon the branch at a time. The points leading to the intermediate siding at Croxley Mills, laid in 1908, are controlled by the train staff key, as well as the points at Rickmansworth Station, manipulated from a ground-frame upon the platform, as also the signals, which continue in use as heretofore.

As soon as Croxley Green junction box is passed, rural and very interesting surroundings reveal themselves. To the left are the wooded heights of Bushey and Oxhey, with Cassiobury on the right, and again on the left, Sandy Lodge, with the River Colne intervening. Next we traverse Croxley Common Moor, having Long Valley and Croxley Hall Woods on the right, together with the River Gade, and the Grand Junction Canal, with its picturesque locks, and old-world barges, often horsedrawn, and gaily painted, as is their wont. Moor Park, with the Mansion, famous as a retreat of Wolsey, next skirts the line on the left for the rest of the journey, while, near the 4-mile post, Croxley Hall Farm is passed on the opposite side, with its famous 15th century tithe barn of hewn timber.

Outside the Rickmansworth platform the River Chess is crossed, and the railway terminates but a few yards from the ancient churchyard of the parish of St. Mary-the-Virgin, at a level of about 60 ft. below that of Watford Junction station.

A double line of electrified rails now exists betwen Watford and Croxley Green junctions, the latter being of double line order as applying to the Rickmansworth and Croxley Green branches also. High Street has completely changed its character as a branch station and is now served by an island platform; the rails are track-circuited in both directions. The

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former service of 5 trains in each direction is now replaced by a number approaching (at the time of writing) 280 per diem, including steam and electric trains *via* Bushey, as well as the quarter-hour service of the London Electric Railway. Goods services also exist over that route. Added to the list are the Rickmansworth and Croxley steam services, as also corresponding goods trains. The direct connection between Colne Junction and that of Croxley Green, rising at 1 in 60 towards Bushey has not, at the time of writing, been brought into use. High Street cabin controls the points of junction for Bushey as well as the Benskin brewery sidings. Those relating to the Urban Council are separately and specially locked by electricity at the High Street end, being ¼-mile distant from the cabin in question.

Croxley Green junction cabin controls the connection with the electric car sheds, as well as two sets of junction points, together with the train staffs applying to each single line branch. This box also controls the Urban Council siding at the down end, and is 1½ miles distant from Watford Junction station. The points upon the Rickmansworth branch, situated at 2¾ miles from Watford Junction, and leading to the Croxley paper mills, are controlled by the train staff key. A rail motor service exists upon the Croxley Green branch, the modern southern suburbs of Watford being served by its intermediate station known as "Watford West."

The public level crossings formerly known as "Loates Lane" and "Watford Field" are now superseded by bridges, but several occupation, or farm crossings remain upon the Rickmansworth single line, in addition to that of Moor Park, as already noticed.

"TRANS-CANADA, LIMITED" EXPRESS, CANADIAN PACIFIC RAILWAY.

Photo.] [*C. J. R. Littlebury.*

WEST-BOUND TRAIN (NO. 7) AT LAKE LOUISE, ALBERTA.

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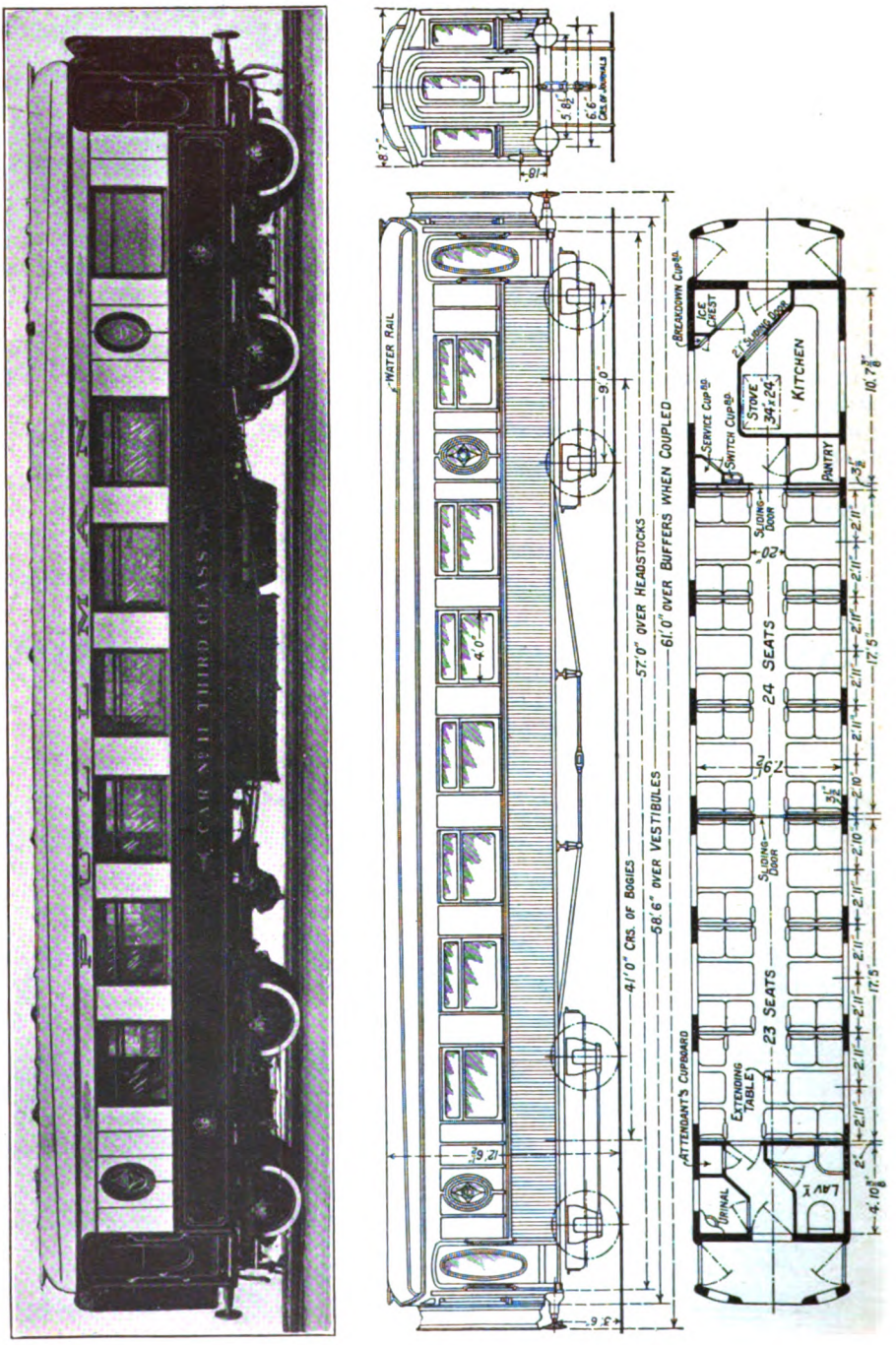

NEW THIRD-CLASS PULLMAN CAR, LONDON, BRIGHTON & SOUTH COAST RAILWAY.

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New Third-Class Pullman Cars, L.B. & S.C.R.

THIRD-CLASS Pullman cars running on the London, Brighton and South Coast Railway have proved so popular that the Pullman Car Company decided to add to their number, and these are now being delivered for service. Six have been delivered, built by Clayton Wagons, Limited, as illustrated.

The new cars, although conforming in general exterior appearance to the usual "Pullman" design, differ somewhat in actual construction. The previous cars, having the standard "Pullman" type of construction, were erected with the bodies and underframes as one combined unit, but in the new cars it has been found possible to reduce weight considerably by the introduction of a steel underframe, with steel bogies, lighter than that previously used.

The bodies, which are now built as a separate unit, are framed of pitch pine and teak, and are strongly braced to prevent "racking." Mahogany has been used in the external framing, panelling and matchboarding, which are painted and finished in the standard "Pullman" colours. In order to reduce noise and to improve the riding qualities of the cars, a number of special body cushions have been placed between the underframe and the body. The cars are fitted with the "Westinghouse" brake, arranged to apply an even pressure on all the bogie wheels. The bogies, which are of the four-wheeled type, have laminated bearing springs, with auxiliary rubber springs above the axleboxes, and coil springs on the bolsters.

Principal dimensions of the cars, each having a tare weight of 32 tons 8 cwt., are :—

Length over vestibules ..	58 ft. 6 in.
Length over buffers ..	61 ft.
Extreme width	8 ft. 7 in.
Centres of bogies apart ..	41 ft.
Bogie wheelbase	9 ft.
Extreme height (unloaded)..	12 ft. 6½ in.

Reference to the plan shows that the seating accommodation is arranged in two large compartments, giving a total seating capacity of 47, each passenger being provided with a separate seat, the seats nearest the gangway being arranged to tip up, so as to facilitate access to those near the windows. The seats are upholstered in Duratex leather of different colours to harmonise with the general decorative scheme. Each compartment is furnished with the usual parcel racks, hat and coat racks, &c., and at the end of one of the compartments a clock of handsome appearance is fitted just above the cornice moulding. Removable tables with glass tops of the usual "Pullman" type are provided.

Internally, the compartments are finished in figured mahogany, and inlaid, but each car has a distinct character of its own, and in no two instances has the same type of mahogany and inlaying design been adopted. Ceilings are finished dead white, the ends being coved, while the use of enriched mouldings gives a pleasing decorative effect. Floors are covered with linoleum and provided also with carpets running the full length of the compartment, the colours being in harmony with the upholstering and panelling. Special attention has been given to the ventilation of these compartments by means of torpedo air extractors, electric fans, &c.

At one end of the car the kitchen, pantry, stores, cupboards, ice chests, &c., are arranged and equipped in the most complete manner for the provision of meals and refreshments. At the opposite end is placed the standard type of "Pullman" toilet compartment. The panelling of the vestibules, corridors, lavatories, &c, is carried out in specially selected mahogany, the ceilings of these compartments being finished dead white, and, while the floors of the lavatory, kitchen and pantry are covered with "Decolite," those in the corridors and vestibules are of inlaid black and white rubber tiling.

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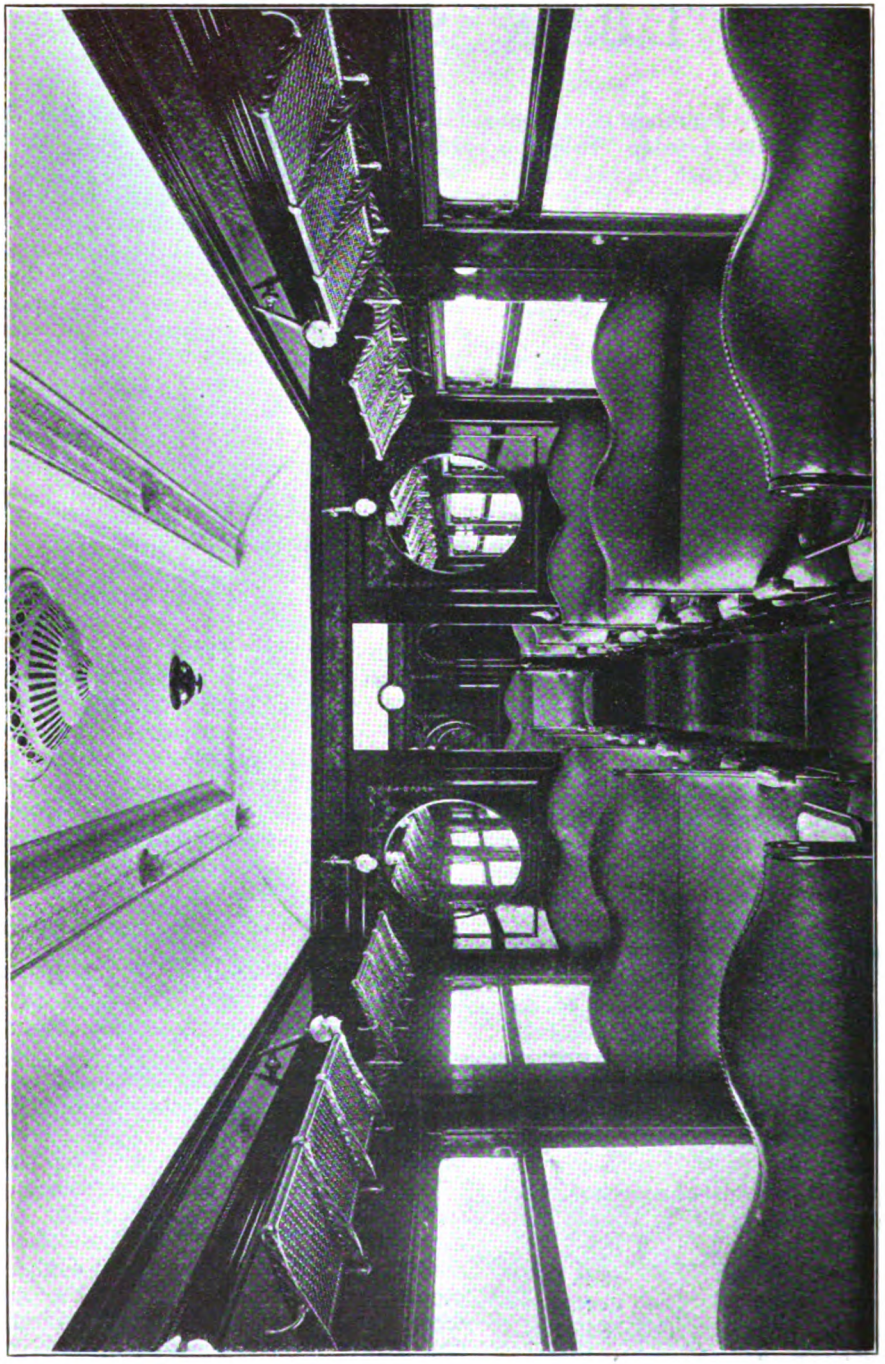

INTERIOR OF NEW THIRD-CLASS PULLMAN CAR, LONDON, BRIGHTON & SOUTH COAST RAILWAY.

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British Locomotive Practice and Performance.

By CECIL J. ALLEN,
A.M.Inst.T., A.I.Loco.E.

Photo.] [*A. T. Daines.*

GREAT WESTERN RAILWAY.

Birmingham express passing Brentham Halt.
4 4-0 locomotive, No. 3810, "County Wicklow."

AN interesting letter reaches me from a valued correspondent of long standing, who has devoted a great deal of time during the past twelve months in seeking to determine the maximum horse-power exerted by various types of locomotive in this country when running uphill. Alluding with some appreciation to my article in the issue of last August on the work performed by Great Northern locomotives between London and Grantham, both during the war and subsequently, on express trains of exceptional weight—an appreciation which quite a number of readers, judging by their letters, have been kind enough to share—my friend explains the methods which he adopts in order to arrive at his results. "The underlying idea," he writes, "was to have some basis on which to compare locomotive performances, and although the results may not represent absolutely the horse-power developed, the *relative* values should be correct. The principal difficulty is to obtain accurately the work done against frictional resistances, and for this I have used certain curves which were reproduced in the *Locomotive Magazine* for June, 1910, as I know of no resistance curves or calculations likely to prove more accurate. From these curves I have deduced certain curves of my own"—re-drawn for reproduction herewith—"the horse-power being shown in each case for a locomotive (with tender) or train of 100 tons weight respectively; the resistance in respect of any weights other than these may be calculated without difficulty."

"The other horse-power component—resistance due to gravity—may be worked out from first principles, thus:—

$$\text{H.P. against gravity} = \frac{\text{vertical rise per min. (ft.)} \times \text{load lifted (lb.)}}{33{,}000}$$

$$= \frac{\text{miles per hour} \times 5{,}280}{60 \times \text{gradient.}} \times \frac{\text{tons lifted} \times 2{,}240}{33{,}000}$$

$$= 5{\cdot}97 \times \frac{\text{miles per hour} \times \text{load in tons}}{\text{gradient.}}$$

In the last-mentioned formula 'gradient' equals the distance travelled during which the train is lifted 1 ft., *i.e.*, for a rise of 1 in 200, 'gradient' = 200. On Potter's Bar bank of the Great Northern Railway, for instance, the horse-power exerted against gravity with a train-load of 100 tons—locomotive, tender and coaches—equals

$$5{\cdot}97 \times \frac{\text{miles per hour} \times 100}{200}$$

or 2·98." A figure such as 100 tons

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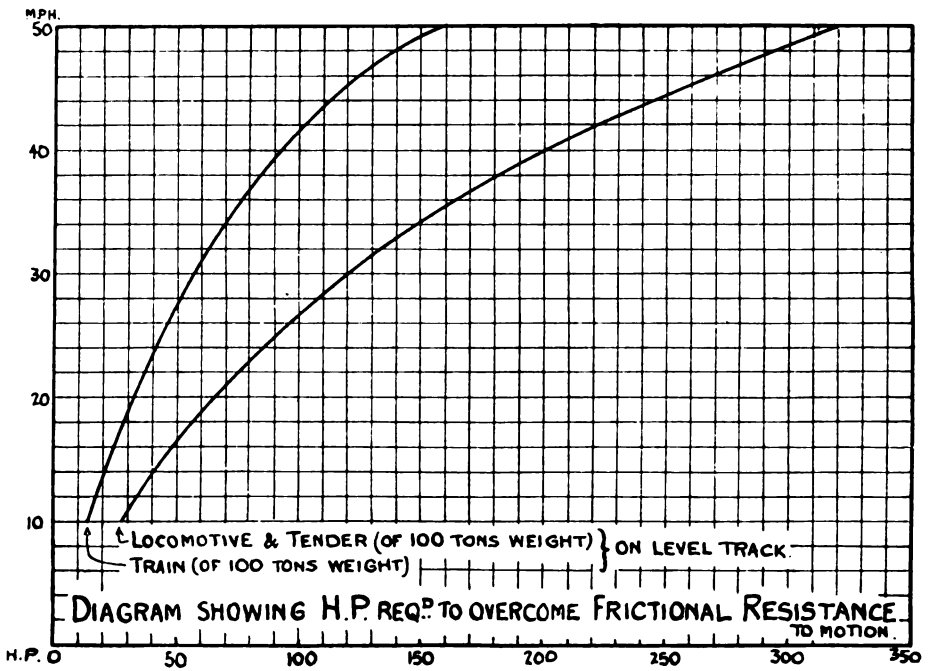
to cover a modern train is, of course, impossibly low, seeing that engine and tender alone would weigh more than that, but it has been chosen merely as a convenient unit. For a gross load of 200 tons the figure is 5·97, for 300 tons 8·96, and so on in proportion; but the reader in using this formula must be careful to remember always to include the weight of the locomotive and tender, as well as that of the train.

Using a larger and more detailed edition of the curves reproduced, and calculating the work done against gravity in the manner indicated, my friend then proceeds to take the table of runs given on pages 98–99 of my August article as the basis of his observations, which he confines to the ascent of Potter's Bar bank—a continuous ascent of 8¼ miles at 1 in 200. It is, of course, vital in such calculations to select an incline of sufficient length for the speed to fall to a *sustained* figure; entirely erroneous results would be given if the minimum speed at the summit of a bank, recorded while the speed was still falling —*i.e.*, would certainly have continued to fall were the bank of greater length— were taken as the basis. My correspondent has therefore selected from the table the *average* times between New Barnet, 4¾ miles from the commencement of the bank, and Potter's Bar, the summit, a distance of 3½ miles. It is the work of superheated "Atlantic" No. 1453 in column 4, on the 5.30 p.m. down express, which appears to stand out from all the others. "I make the average horse-power exerted by No. 1453," my friend writes, "a little over 1,400. The highest I have ever noted myself with an engine of this type is 1,230 h.p., so No. 1453 was evidently making a most ex-



ceptional effort on this occasion. Behind Nos. 1401, 1436 and 1442, in columns 1, 2 and 3 respectively, the running times are equivalent to 1,070, 1,140 and 1,165 h.p."

"You may like to know," the letter continues, "what figures I have obtained for other types of locomotive. I have only made the calculations in cases where I have had a good many trips behind the particular class of engine concerned. The figures on the London and South Western Railway, with which I am more particularly familiar, deduced from work up Litchfield bank, and up to mile-post 31,

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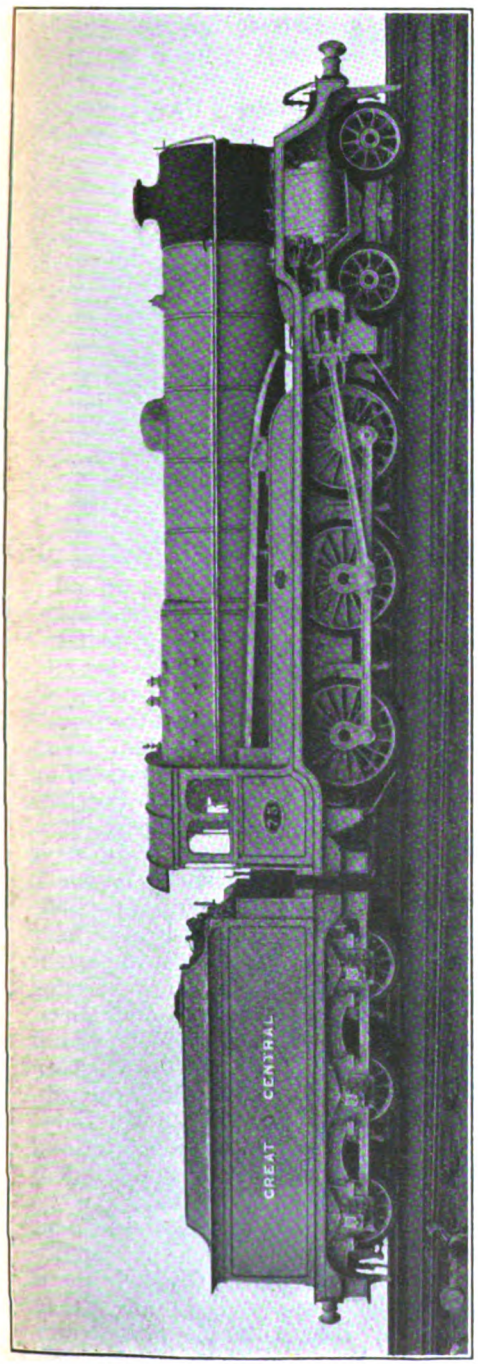

FOUR-CYLINDER EXPRESS GOODS LOCOMOTIVE, GREAT CENTRAL RAILWAY.

No. 72 of this class, but fitted for burning oil fuel, was illustrated on page 90 of the August RAILWAY MAGAZINE, when principal dimensions were given.

from the London direction, work out as follows :—

	Maximum Recorded H.P.	Average of six best Performances. H.P.
4-6-0 4-cylinder, 443 class	1,217	1,155
4-4-0, 463 class ..	1,173	1,058
4-4-0, 415 class ..	914	824
4-4-0, 703 class ..	877	829

The 415 class seem little better than the 703 class ; in fact, the average figure is practically the same "—a result of which is entirely in accordance with my own experience. "Most of the runs were made before superheating came to be so extensively employed, but I have not found that superheating has appreciably affected maximum horse-power on the London and South Western Railway." I might add that rough calculations in respect of three recent runs I have made with the Urie 4-6-0 engines of the "736" class on the same railway show very uniform results in regard to maximum horse-power, the average being about 1,200 and the absolute maximum 1,220, and it is remarkable to note that the engine in the latter case was being worked at a cut-off of 40 per cent. only, or a long way off its full capacity. But of these trips more in the next issue

Continuing, my correspondent adds some remarkable figures on the Great Central, Great Eastern and Great Western Railways, from timings made in the first instance from Rickmansworth up to Amersham, Aylesbury up to Wendover, Denham to Gerrard's Cross and West Wycombe to Saunderton ; in the second principally from Duxford Box up to Whittlesford, on the Cambridge main line ; and in the third at various points, including Bicester-Ardley, Hungerford-Savernake, through Box Tunnel, and elsewhere. Here are the results :—

	Maximum Recorded H.P.	Average of six best Performances. H.P.
Great Central Railway—		
4-4-0 "Director" class	1,301	1,181
4-4-2 "Atlantic" class	1,115	1,072
Great Eastern Railway—		
4-6-0 "1500" class	1,423	1,234
4-4-0 "Claud Hamilton" type	1,089	1,002
Great Western Railway—		
4-6-0 "Saint" class ..	1,362	1,289
4-6-0 "Star" class ..	1,809	1,537

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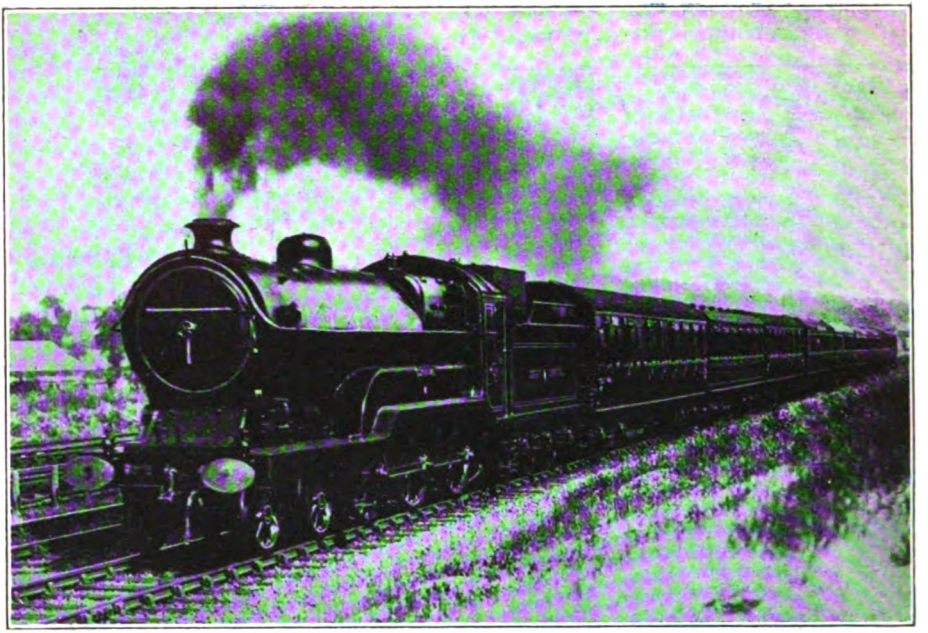

Photo.] GREAT CENTRAL RAILWAY. [*F. E. Mackay.*

Down Manchester express. 4-6-0 locomotive, No. 425, "City of London" (oil-fired).

The results last mentioned are astonishing, although it is impossible to deny that, in relation to the others, the work of these Great Western four-cylinder engines takes exactly the place that one would expect. So high a working pressure as 225 lb. per sq. in. is, of course, a notable asset in the achievement of such performances, although it requires something more than that fully to explain them.

"I have worked out various other results," my friend adds, "but await further trips in order to obtain reliable figures in regard to horse-power. Three trips, made behind Patrick Stirling's famous 8-ft. single-drivers on the Great Northern Railway some 15 years ago, gave very consistent results of 753, 773 and 785 h.p. respectively. I fear that the latter results would give rather a shock to that select body of railwayists who still maintain that the Great Northern Railway should continue to employ the 4-2-2 type of engine on its express trains." The letter concludes: "Generally speaking, the idea was to make the test on a section of a fairly long up-grade with a rising approach, so as to eliminate the effect of any energy previously stored in the train." This is an exceedingly important point, and cannot be too strongly impressed on those who employ the methods described as a basis for future calculations. It is essential, if these calculations are to have any value at all, that the speeds on which they are based shall be, as nearly as possible, uniform or sustained speeds, as I have explained previously. Another important matter to bear in mind is that, in arriving at the weight of the locomotive and tender, the *full* weight in working order should not be employed, unless the record has been made near the commencement of the run, but that, as far as possible, some allowance should be made for the weight of coal and water that has been consumed out of the tender supply.

In a subsequent letter, my correspondent adds some further calculations in reference to the two up runs on the Great Northern Railway which appeared in my article last month. "I make the horse-power exerted by No. 1001," he writes, "on Stevenage bank 1,290, and that by No. 290 with the 600-ton load behind the tender, 1,315 h.p. In both cases I have

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taken the *average* speed between Hitchin and Stevenage, *i.e.*, 39·6 and 34·0 m.p.h. respectively. No. 1001's 48 m.p.h. on Abbot's Ripton bank comes out at 1,740 h.p., a mighty effort of which, up to the present, I have only found the four-cylinder Great Western Railway 4-6-0's capable. But I have had no trips behind the Great Northern three-cylinder 'Moguls' as yet." I may add that No. 1001's speed was practically a sustained speed as we approached the summit of Ripton bank, and from Hitchin to Stevenage it was absolutely so; in fact, when the engine was "opened out" on passing Hitchin, as I mentioned, the rate actually rose slightly for a short distance.

But now I must hasten on to performance; before doing so, however, admission should be made of the thanks due to my friend for the lucid manner in which he has opened up a subject which will doubtless prove of considerable interest to readers.

By the kindness of Mr. P. C. Tempest, General Manager of the South Eastern and Chatham Railway, I have once again been afforded the opportunity of sampling the performance of the locomotives of that railway, and some noteworthy feats have come under my notice, one in particular being quite exceptional in character. This was performed on the 4 p.m. express *ex*-Charing Cross—one of the four trains now accelerated to cover the 70 miles between there and Folkestone Central in 85 min.—by No. 761, one of the large 4-4-0 superheaters, with an eight-coach train weighing 234 tons empty. As practically every seat in the train was occupied, the gross load was not less than 255 or 260 tons. From the start it was evident that we were in for some good running, as the driver began to gain time even on the uphill sections, from which the bulk of the time composing the 5-min. acceleration of this schedule has been cut. We ran the tortuous 1·8 miles to London Bridge in 4 min. 20 sec., and accelerated in great style over the three level miles thence to New Cross, passing the latter station, 4·9 miles, in 8 min. 5 sec., at 55 m.p.h. The steep ascent which commences at St. John's, and from 6⅞ to 10¼ miles (Elmstead) is continuously at 1 in 140–120, we breasted at a minimum of 32½ m.p.h., passing Hither Green, 7·1 miles, in 10¾ min., and Chislehurst, 11·2 miles, in 17 min. 10 sec. There are two short level breaks in the ascent—10¼ to 11 and 12⅞ to 13¼ miles;

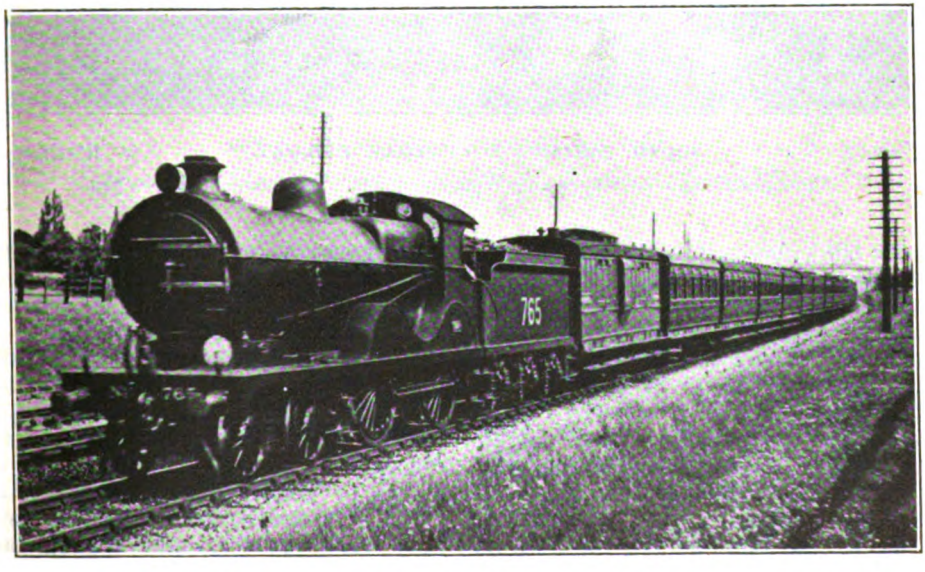

Photo.] SOUTH EASTERN & CHATHAM RAILWAY. [*F. W. Curtis.*

Up Deal and Dover express. Large 4-4-0 locomotive, No. 765.

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between them the inclination is 1 in 146–234, and from 13¼ to 16¼ miles the line rises at an unbroken 1 in 120, with a subsequent ¾-mile at 1 in 170 from Knockholt to the actual summit at 17 miles. On the easier part of the bank we rose to 43½ m.p.h., and the 3 miles at 1 in 120 did not bring us below 34; thus we passed Orpington, 13·8 miles, in 21 min. 5 sec., and Knockholt, 16·5 miles, in 25 min. 20 sec., ¾-min. ahead of time.

On the descent to Dunton Green we touched 68 m.p.h., and this carried us up the 1⅝ miles at 1 in 160 to Sevenoaks tunnel at a minimum rate of 56½ m.p.h.; 40½ min.); as it was, we took 40¼ min., the slow speed through this station also increasing the subsequent time to Paddock Wood. Inclusive of 1½ miles rising at 1 in 258 from the commencement, the last-mentioned 5·3 miles occupied 6 min. 40 sec.; by this time we were again running at 64½ m.p.h., and maintained without a break from 59 to 65 m.p.h. over the 10·4 miles of undulations thence to Headcorn, which occupied 10 min. precisely. The subsequent ascent of 3½ miles at 1 in 451-244-343-266 did not bring us below 56½ m.p.h., and on passing Ashford we had got up again to 65. We

Photo.] SOUTH EASTERN & CHATHAM RAILWAY. [*F. W. Curtis.*

Victoria–Ramsgate express passing Westgate-on-Sea. 4-4-0 locomotive, No. 740.

then on Hildenborough bank we attained the highest speed I have ever yet recorded on the South Eastern and Chatham Railway—77½ m.p.h. Dunton Green, 20·5 miles, was passed in 29 min. 55 sec., Sevenoaks, 22 miles, in 31 min. 20 sec., and Hildenborough, 26·9 miles, in 35 min. 50 sec., but the penalty of such undue haste was that we caught up the 3.50 p.m. Hastings train, crossing our track at Tonbridge East Junction, and so were brought to a dead stand at a point 29·1 miles from Charing Cross, in 37 min. 50 sec. from the start. Apart from this delay, we should have passed Tonbridge, 29·5 miles, in 38 or 38¼ min. from London (allowed had thus covered the 26·6 miles from Tonbridge to Ashford in 27¾ min., and so thoroughly good had been the locomotive work, that, despite our 35 sec. dead stop outside Tonbridge, we were still 1½ min. ahead of time, having covered the 56·1 miles to Ashford in exactly 68 min. The engine was still pressed, so that we did not fall below 55 m.p.h. on the long ascent to Westenhanger, mostly at 1 in 259-266; Smeeth, 60·4 miles, was passed in 72 min. 25 sec., and Westenhanger, 64·1 miles, in 76 min. 40 sec. Then, alas! when we had every prospect of making Folkestone in 83¼ min., Tonbridge stop included, we were unfortunate enough to

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catch up the 3 p.m. out of London, running very late, so that the rest of the run was ruined. But it is quite certain that the net time from Charing Cross to Folkestone Central was nothing at all over 80¾ min. We ran the 47·6 miles from Knockholt to Westenhanger in 51 min. 20 sec., or 49¾ net—a fine achievement.

In comparison with this run, a trip on the 1.30 p.m., with a slightly lighter load of 225 tons, and 5 min. more in which to convey it to Folkestone, was a colourless performance, even though No. 778 did quite well from the time-keeping standpoint. We passed London Bridge in 5 min., and to Tonbridge, where we made the usual reduction of speed, 42¾ min. From Paddock Wood to Headcorn speed ranged between 54 and 61 m.p.h.; we covered the Tonbridge-Paddock Wood length in 6 min. 10 sec., Paddock Wood-Headcorn in 10 min. 50 sec., and Headcorn-Ashford in 12 min. 20 sec., falling to 51 m.p.h. on Pluckley rise and passing Ashford at 60, in 72 min. 5 sec. from London. Here the load was reduced by slipping to 150 tons. Running now very easily, we passed Smeeth in 76¾ min., and Sandling Junction, 65·4 miles, in 82½ min.; not exceeding 60 m.p.h. on the descent to Folkestone

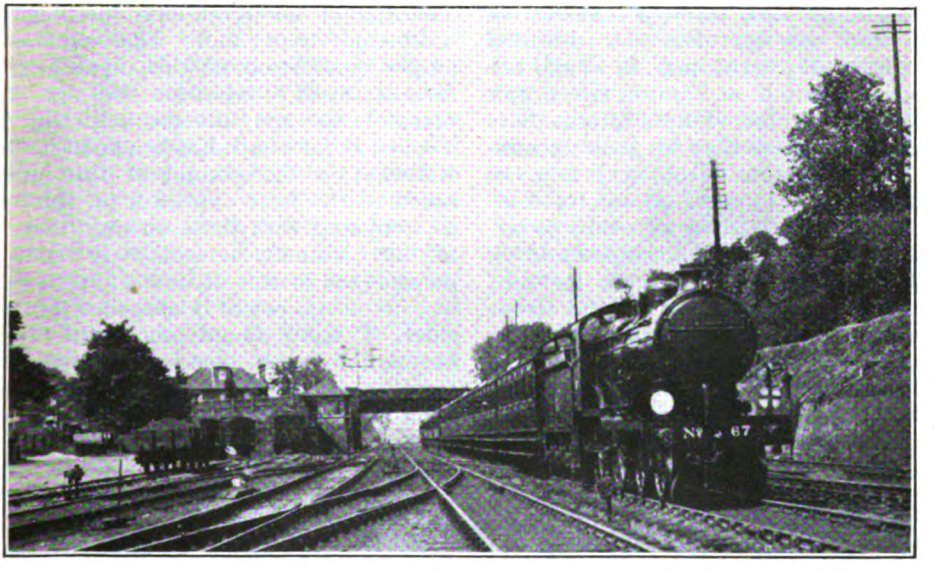

Photo.] SOUTH EASTERN & CHATHAM RAILWAY. [*E. A. Gurney-Smith.*

Second part of 11 a.m. *ex*-Victoria Continental Boat Express passing Bickley.
Rebuilt 4-4-0 locomotive, No. 67.

New Cross in 9 min. 20 sec., at 50½ m.p.h.; we were through Hither Green in 12¼ min., and, with a minimum of 29½ m.p.h. on Grove Park bank, passed Chislehurst in 19 min. 35 sec.; while an increase to 41 m.p.h. at Orpington and a lowest rate of 32 at Knockholt enabled us to breast these two stations in 23 min. 55 sec. and 28 min. 25 sec. respectively. We were now ½-min. behind time, but passed Tonbridge ¼-min. in front, despite leisurely downhill running, not exceeding 64 m.p.h. on Dunton Green bank, nor 67 before Tonbridge, with an intervening minimum of 47½. To Dunton Green we took 33 min. 20 sec., to Sevenoaks 34 min. 55 sec., and we arrived in 87 min. 50 sec. from London, 2¼ min. before time.

An excellent trip that I made over the same route with a much heavier load was one on the first portion of the 11 a.m. down Calais boat train, made up to a 47-axle load of 299 tons tare and 315 tons gross (five eight-wheelers, three twelve-wheelers and three six-wheelers). The engine was one of Mr. Maunsell's fine superheated rebuilt 4-4-0's, No. 497. As usual, we were banked out of Victoria to Grosvenor Road Bridge, up the 1 in 61; so we passed Herne Hill, 4 miles, in 8¼ min. At Dulwich, on the 1 in 100 ascent, we were brought down to a walking pace

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by adverse signals, but breasted Sydenham Hill summit, 5·7 miles, in 12¼ min., and got through Beckenham Junction, 8·7 miles, in 17 min. 20 sec., and Bickley Junction, 12·6 miles, in 22¾ min. Of the 8·6 miles from Herne Hill to this point, five are inclined adversely at 1 in 100 or steeper. Reducing speed for the junction, we ran gently round the curve up to the old South Eastern main line, and passed Orpington, 14·9 miles, in 26 min. 20 sec.

To all mileages previously given in respect to this route, 1·1 miles should now be added as representing the extra distance from Victoria. On the 1 in 120 up to Knockholt we did not fall below 32½ m.p.h., and thus got through that station in 29 min. 40 sec. But our downhill speeds were very restrained, as we did not go above 60 m.p.h. at Dunton Green, nor 66 before Tonbridge, with an intermediate minimum of 44, so that we took 25 min. 35 sec. to Dunton Green, 37¼ min. to Sevenoaks, and 45 min. 40 sec. to Tonbridge. Nevertheless, we were now 50 sec. ahead of time. The Tonbridge-Paddock Wood length occupied 6 min. 40 sec., and between the latter station and Headcorn (a run of 10 min. 5 sec.) we reached the exceptional speed—for this stretch—of 66 m.p.h. at Staplehurst. From Headcorn to Ashford took 11¼ min., completing a notable time, with such a load, of 28 min. for the 26·6 miles from Tonbridge to Ashford. Not falling below 51 m.p.h. on the ascent past Smeeth and reaching 66 m.p.h. on Shorncliffe bank, we passed Sandling in 84 min. 5 sec. and Folkestone Central in 88 min. 40 sec., or, allowing for the Dulwich slack, in 87 min. net. Such a time is distinctly noteworthy, taking into consideration the load, and the fact that, as compared with the start from Charing Cross, that from Victoria is 1·1 miles longer, and a very great deal harder in grading. A gentle run down to Dover, with reduced speed over the site of the slip in the Warren, brought us into the Marine Station in 99 min. 25 sec. from Victoria, or about 96 min. net, against a schedule of 103 min. This run was an ample vindication of the capabilities of Mr. Maunsell's rebuilds. Not so very many years ago adverse criticism was levelled at the South Eastern and Chatham Railway on the ground of the inferior speed of the boat expresses on this side, as compared with those on the other side of the Channel; nowadays it seems to me that the boot is distinctly on the other leg, as from recent experience of both sides, I have found quite the better locomotive work being performed over here, proportionately to the weight and tractive power of the locomotives employed.

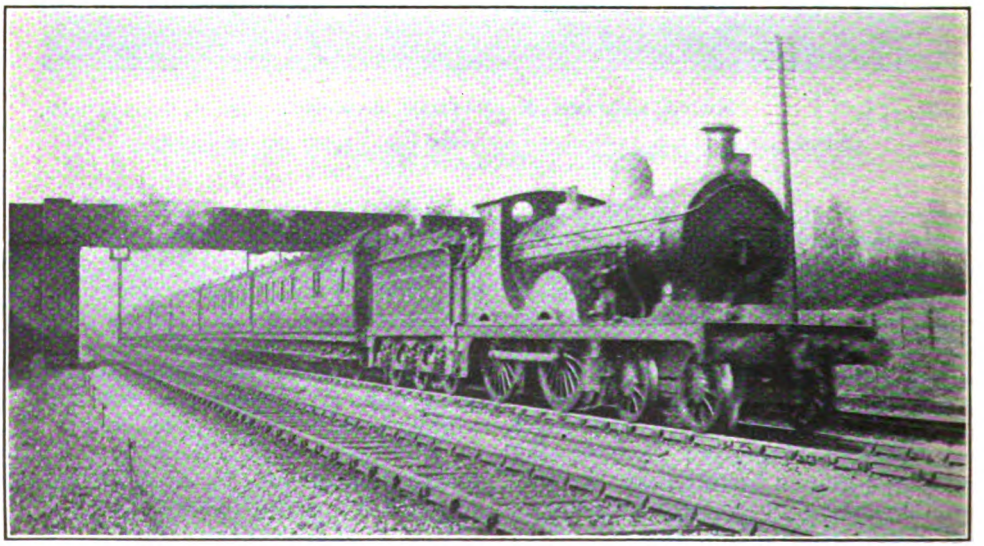

Photo.] SOUTH EASTERN & CHATHAM RAILWAY. [*H. Laundy.*

Afternoon down Continental express. 4-4-0 engine, No. 744.

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In the up direction I have not been quite so fortunate. I have made a journey on the 5 p.m. 85-min. train from Folkestone to Charing Cross, on which we lost exactly 5 min., two from a signal delay, one clearly by locomotive and two further by locomotive in a manner quite inexplicable. The engine in question was large 4-4-0 No. 781, and the load six standard eight-wheelers and two Pullmans, weighing 223 tons empty, and 245 tons with the heavy passenger complement. Up the continuous 1 in 265 to Sandling we accelerated excellently, speed reaching 44½ m.p.h., and still rising as we topped the summit. So we were through Sandling Junction, 4·6 miles, in 8 min. 35 sec. But then there set in a most peculiar "dry rot," the driver, after attaining speed on the subsequent down grades, shutting off steam until we were doing no more than 47 m.p.h. After this we did get up to 61 m.p.h. at Ashford, passed in 19½ min. (13·9 miles), but we had thrown away a full 2 min., with subsequent results yet to be related. Very fair running ensued to Tonbridge, speed varying between 53 m.p.h. (before Pluckley) and 64½ (at Headcorn), up to Paddock Wood, after which the 2-mile rise at 1 in 270 to 31½ miles brought us down to 49 m.p.h. Ashford-Headcorn took 11 min. 10 sec., and Headcorn-Paddock Wood 10¾ min., after which, as a result of the 2 min. dropped before Ashford, our path was fouled by the 5.5 p.m. from Cannon Street to Hastings, and we were all but brought to a stand outside Tonbridge. Consequently Paddock Wood-Tonbridge took as much as 7 min. 40 sec., and we passed the latter station, at a lower rate than usual, in 49 min. 5 sec. from Folkestone, 4 min. behind time.

On the ascent to Sevenoaks we caught very badly the strong south-west wind blowing on the day in question, which helped to bring us down on the 4 miles at 1 in 122 from 37½ to 30 m.p.h., but all the way up the 1 in 144 through the tunnel we were recovering speed, and emerged at 34 m.p.h. So the 7·5 miles from Tonbridge to Sevenoaks were run in 13¾ min., the 1·5 miles on to Dunton Green, with a top speed of 56½ m.p.h., in 1¾ min., and the 4 miles thence up to Knockholt (including the 2½ at 1 in 143-150, on which we fell to 32 m.p.h.) in 5 min. 55 sec. On passing Orpington in 73 min. 25 sec. from Folkestone (at 65 m.p.h.) we were at our maximum lateness of 7½ min., but by dint of rather faster running than usual on to Charing Cross, we regained 2½ min. of arrears, out total time from Folkestone being 90 min. 5 sec. There was no excessive speed, the maximum being only 67 m.p.h., at Hither Green, and the time for the 8·9 miles from Orpington to New Cross 8 min. 50 sec. After that we ran on to New Cross in 3¾ min., and from there to Charing Cross in 4 min. 5 sec. Net time was 86 min., and with normal running from Westenhanger to Pluckley we might have made the trip in 86 min., but I do not think we could quite have managed 85 min. This running was much below the level of that made on the 4 p.m. down.

On the Chatham road, with one bright exception, I have not been fortunate in my experiences. I was unlucky enough to select the 3.15 p.m. 92-min. train from Victoria to Margate on a day of high south-westerly wind, and, to crown all, although the slower and lighter 3.25 p.m. down had a new Maunsell "rebuild," we could only muster an old Wainwright 4-4-0, No. 741, to handle a crowded nine-coach train weighing 260 tons empty and 285 tons full. Very plucky running, however, was made as far as Chatham. Banked in rear out of the terminus, we passed Herne Hill in 8 min. 35 sec., Sydenham Hill in 12½ min., at 25½ m.p.h. (after 2½ miles up at 1 in 100), Beckenham Junction in 16 min. 50 sec. (top speed at Kent House, 55), and Bickley Junction in 22 min. 25 sec., at 34 m.p.h. This was 10 sec. less than the time of rebuild No. 497 on the down boat express, although the latter had been slightly delayed at Dulwich. Continuing, we touched 57½ m.p.h. on St. Mary Cray "dip" and fell to 39 at Swanley; the maximum at Farningham Road was 72½ m.p.h., and the minimum on Longfield bank (3¾ miles up at 1 in 100-132) was 33 m.p.h. So the 5 miles from Bickley Junction to Swanley took 6⅛ min.; the 2·9 miles on to Farningham Road 3 min. 10 sec.; and the 6·3 miles thence to Sole Street 8½ min.; total 40 min. 40 sec. from Victoria. Down the famous bank we went with the usual caution, only at one point reaching as much as 62½ m.p.h.; so we passed Rochester

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Bridge, 32·9 miles, in 47 min. 50 sec., and Chatham, 34·3 miles, in 50 min. 10 sec, Up to this point, therefore, we were less than 2¼ min. "down," but now I should imagine that there began to be some apprehension on the footplate as to the water supply holding out, for the work fell off badly. In fact, the 17·7 undulating miles on to Faversham, allowed 20 min., took 23 min. 5 sec., including a very slight p.w.r. check near Teynham. Slightly better running ensued, speed rising to 56½ m.p.h. after Faversham, falling to 41 on Herne Bay "hump," and increasing to 64½ on the subsequent descent. The —a loss of 11½ min. Then things began to improve. Passing Rochester Bridge in a further 1 min. 55 sec., we mounted the 6·1 miles thence to Sole Street (4⅛ at 1 in 100 and ½ at 1 in 132) without the speed falling below 24½ m.p.h., in 12 min. 20 sec. We then reached 67 m.p.h. on Longfield bank, fell to 36 at Swanley, touched 60 at St. Mary Cray, and dropped again to 42 before Bickley Junction. There was no excessive speed on the subsequent falling grades; in fact, we did not exceed 60 m.p.h. at Shortlands, eased through Beckenham Junction and fell to 34 m.p.h. at Sydenham Hill. So we took 7 min. from

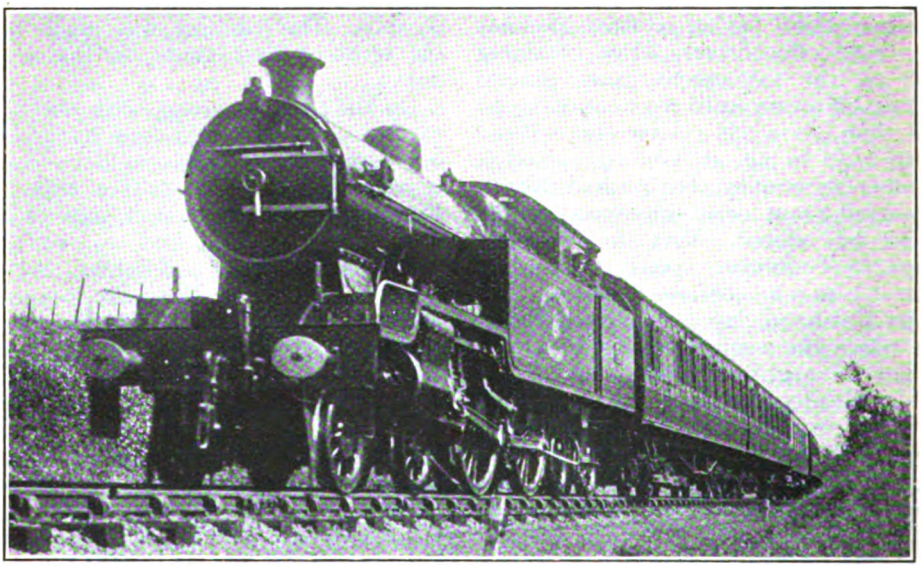

Photo.] METROPOLITAN RAILWAY. [*Chas. S. Lake.*

Pullman Car Train near Amersham. New 4-4-4 superheater tank locomotive.

10·7 miles from Faversham to Herne Bay occupied 12½ min., and the 11·2 miles on to Margate 13¼ min., total 99 min. exactly, or 98 min. net for the exceedingly difficult 73·9 miles from Victoria. The engine had lost 6 min. net on schedule—in the circumstances perhaps not too bad an achievement.

Coming up on the 5.20 p.m. express, and facing the same wind, Wainwright 4-4-0 No. 493, with a 43-axle train weighing 290 tons full, made a disastrous start, taking no less than 32 min. 55 sec. to Faversham, and, inclusive of a bad p.w.r. check near Teynham, 56½ min. to Chatham Sole Street to Farningham Road, 3 min. 25 sec. thence to Swanley, 6 min. 25 sec. to Bickley Junction, 4 min. 25 sec. to Beckenham Junction, 4¼ min. to Sydenham Hill, 2 min. 25 sec. to Herne Hill, and 6 min. 5 sec. into Victoria—total 48 min. 50 sec. from Chatham, 34 min. 35 sec. from Sole Street and 23 min. 35 sec. (allowed 28 min.) from Swanley. From Margate we had taken 105 min. 20 sec., or 103½ min. net, for a journey allowed 98 min.

But on a later date I enjoyed a much better up run over this route, The train concerned was the 5.53 p.m. *ex*-Dover Marine, with a 24-axle load weighing

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200 tons, and the engine No. 736 of the same type. We had reached Gillingham 12½ min. late, but by smart station work there and at Chatham were only 8½ min. late away from the latter place. We passed Rochester Bridge in 3¼ min. from the start, and ran thence up to Sole Street in the excellent time of 11 min. 20 sec., with a lowest speed of 30½ m.p.h. From Sole Street to Farningham Road we ran in 6¾ min., attaining no less than 74 m.p.h. Thence to Swanley took 2 min. 55 sec., with a minimum of 47; touching 64½ m.p.h. at St. Mary Cray we then ran on to Bickley Junction in 5½ min. By passing the latter point in 29¾ min., we had thus regained 4¼ min. on schedule, but unfortunately bad signal checks supervened, and eventually we took 52½ min. to Victoria. On the basis of the previous run, however, the net time was not over 47 min. for the run, which represents a gain of 7 min. on schedule.

A Rochester reader also sends me details of a very fair run up from Chatham with a nine-coach train (the weight of which he does not specify, but, as it was the 8.16 a.m. up, with a full load of passengers, probably not less than 270 tons), made by rebuilt superheater 4-4-0, No. 247, Class D 1. Rochester Bridge was passed in 3 min. 10 sec., and Sole Street in 16 min. 5 sec., with a minimum of 22½ m.p.h. This was rather poor, but fast running was made subsequently. Sole Street-Farningham Road was run in 6 min. 50 sec., with a maximum of 74 m.p.h., and Farningham Road to St. Mary Cray, 5·7 miles, in 5 min. 40 sec. (no time is given at Swanley). Slacking over the junctions to Chislehurst and not exceeding 60 m.p.h. thereafter, No. 247 passed Chislehurst, 22 miles, in 31 min. 55 sec., and despite adverse signals outside London Bridge, stopped at that station, 31·4 miles, in 44¾ min., or 43¼ min. net. The time allowed is 46 min.

And lastly, before I close, a few words about a fine run on the Hook of Holland boat express from Liverpool Street, Great Eastern Railway—a run that in certain particulars beats all my previous records, and which is in any case by far the best effort that I have recorded on this railway for many years past. No. 1501, superheated 4-6-0, was the engine—with which, many years ago, I had one of my most notable runs on the "Norfolk Coast Express"—and Martin, of Parkeston shed, her most capable driver. The load was a heavy one of eight corridor eight-wheelers, including dining cars, two 12-wheeled Pullmans, and two 6-wheelers—50 axles—weighing 340 tons empty and about 355 tons full. With such a train as this, over a road with the adverse grading and many slacks of the Great Eastern, a timing such as 82 min. for the 69 miles to Parkeston becomes almost a "counsel of perfection," but driver Martin made a tremendous effort to maintain it. The times achieved, however, needed very hard work on the part of the engine, as was evident from the sound of the exhaust at various points *en route*. Getting away well with a sustained 32 m.p.h. up the 1 in 70 to Bethnal Green, we passed that junction, 1·1 miles, in 3¼ min., and despite a signal check at the Western Junction at Stratford, the 4 miles to the latter station were negotiated in 7 min. 55 sec. Up the gradually rising grades thence to Harold Wood we regained speed well, attaining finally as much as 55½ m.p.h. before the ascent of Brentwood bank was commenced—a most unusual feat. So Ilford, 7·3 miles, was passed in 12 min. 50 sec., Chadwell Heath, 10 miles, in 16 min. 5 sec., Romford, 12·4 miles, in 18 min. 50 sec., and Harold Wood, 15 miles, in 21 min. 50 sec. Brentwood bank proper consists of 3 miles at 1 in 84-99; on this we did not fall below 33 m.p.h., Brentwood, 18·2 miles, being passed in 26 min., Ingrave summit, 19·3 miles, in 27 min. 50 sec., and Shenfield, 20·2 miles, in 29 min. 5 sec. Thus we had kept the exacting schedule of 13 min. from Chadwell Heath, and, deducting the delay outside Stratford, our net time to Shenfield was also just the 28 min. allowed. Only once previously have I timed an outward-bound express with such a load through Shenfield in 28 min., and that was with the same engine and a 51-axle train on the trip previously referred to.

But the best was to come. Accelerating with tremendous rapidity, we reached 69 m.p.h. before Ingatestone, and 70½ afterwards, passing Ingatestone, 23·6 miles, in 32 min. 20 sec., and covering the 9·5 miles between Shenfield and Chelmsford (38 min. 5 sec.) in 9 min. exactly. Slacking through that station,

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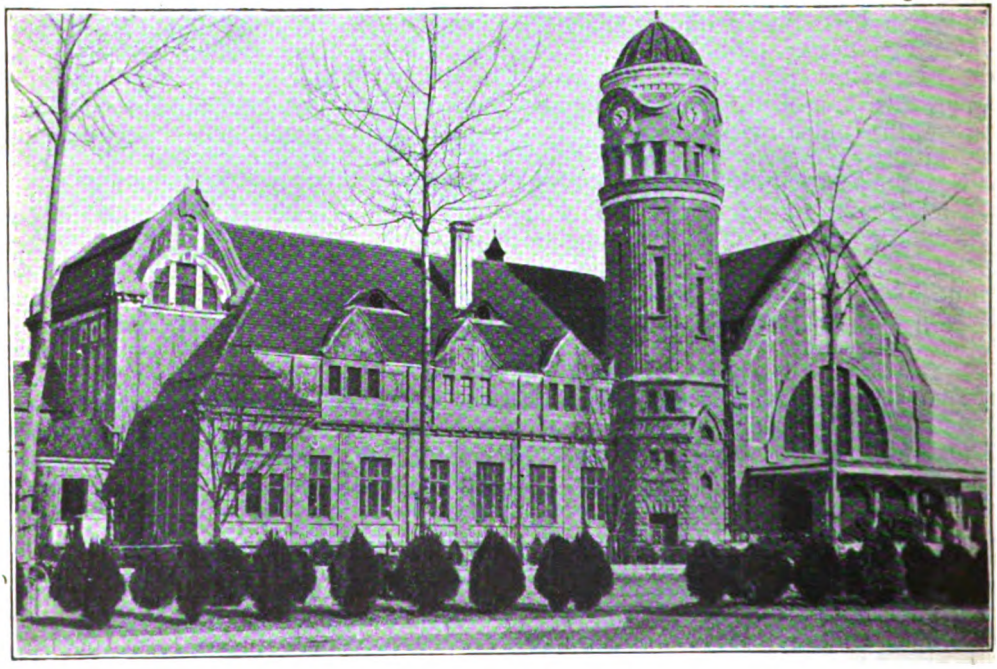
we got up again to 61 m.p.h. before Hatfield Peverel (35·9 miles, 44 min. 25 sec.) and passed Witham, 38·6 miles, in 47 min., at 69 m.p.h. Passing Kelvedon, 42·3 miles, in 50 min. 25 sec., we did not fall below 55 m.p.h. on the subsequent 2 miles up at 1 in 222, and so breasted Mark's Tey, 46·6 miles, in 54 min. 55 sec. The descent of Lexden bank was made very steadily, at a speed not over 64 m.p.h., and then, unfortunately, in consequence of relaying in progress, it was necessary to reduce speed below the prescribed figure of 40 m.p.h. at Colchester, this delay costing us well over one minute, owing to the steepness of the rise immediately following. Nevertheless we passed Colchester, 51·7 miles, in 60 min. 20 sec. or 59 min. net, having run the 30·2 miles from Shenfield to Lexden Box in the splendid time of 29 min. 25 sec. Owing to the severe slack at Colchester, and the existence of a bad p.w.r. check at Manningtree, the rest of the run was of less interest; we passed Manningtree, 59·5 miles, in 71½ min., and reached Parkeston, 68·9 miles, in 86 min., 4 min. after time. Of this small loss I attribute 1 min. to Stratford check, at least 1½ min. to the p.w.r. caution at Colchester, and the remainder to the slack at Manningtree, where, of course, there is always a severe caution, allowed for in schedules, owing to the sharp curve followed by the Harwich branch. Nevertheless, this run would want a great deal of beating; indeed, for time to be kept on these bookings with present loads, in my opinion, involves some of the very hardest locomotive running scheduled in the country to-day.

RAILWAY STATION AT TSINANFU, CHINA.



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British Express Trains in the Summer of 1921.

AN ANALYSIS OF FASTEST AND LONGEST RUNS, RESTAURANT AND PULLMAN CAR SERVICES AND SLIP COACHES.

By "VOYAGEUR."

IT is to the writer a task more than usually congenial on this occasion to set forth and describe the leading features of the summer train services of 1921. Delayed though they were for over two months in consequence of the unfortunate coal dispute, the extensive accelerations of competitive train services promised to come into operation on May 1st were fully inaugurated on various dates early in July, and restored to this country facilities of travel in all directions that fall but very little short of those operating prior to the war. In some respects, indeed—such as the creature comforts embodied in Pullman and restaurant cars—we are already in advance of pre-war standards. With one or two exceptions, however, there is still a little leeway to be made up in the matter of speed.

But in the latter connection it must be remembered that post-war arrears of locomotive maintenance are still by no means fully overtaken, while the bulk of the fuel available is a long way off pre-war quality. Again, in comparing the best overall journey times with those of pre-war years, the reader should bear in mind that the non-restoration to the time-tables of certain of the "crack" pre-war competitive expresses, making long journeys without intermediate stoppage, puts the present times somewhat at a disadvantage. Standard schedules have now been introduced in many directions, and the allowance for stops *en route* necessarily increases the total journey times as compared with the *best* times of the pre-war period, whereas on certain routes the *average* overall times are as good as those previously operating. Indeed, a detailed analysis of the average express locomotive work performed to-day would probably reveal the fact that it is in no degree inferior to that required prior to the war.

Without the reproduction of masses of figures, it would be difficult for me to indicate adequately the improvement in the train services between London and the principal cities and towns in the country, and I have confined myself in Table "A," therefore, to the usual method of showing the fastest times now in operation, compared with those current in the summer of 1914, and those obtaining at the time of the Armistice. A slight difference, however, is found on the right-hand side of the table. Instead of following the increase of time from 1914 to 1918 with the decrease from that year to 1921, I have shown the 1921 figures also as an increase on those of 1914, together with the percentage of addition that they embody. At the date of the Armistice the average deterioration of overall journey times, as expressed in this table, was one of 23·3 per cent., which meant an increase of 14 min. in every hour's travelling; in 1920 that figure had been reduced to 13·6 per cent., and now drops still further to 8·6 per cent.—that is, an addition of a shade over 5¼ min. only to each journey of 60 min.

Although by the accelerations of this summer the reproach of the slowness of the competitive services has largely been removed, it is nevertheless interesting to note that the services to Liverpool, Manchester, Leeds, Sheffield and Birmingham still figured in the summer of this year as among those the most backward in improvement, on a per-

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TABLE A.—Fastest Times Between London and Provincial Towns in 1914, 1918, and 1921.

Town.	Distance	Aug., 1921. Fastest Time.	Direction.	Railway.	Fastest Times. Aug., 1914.	Fastest Times. Oct., 1918.	Increase, 1914-1918.	Increase, 1914-1921.	
	miles.	h. m.			h. m.	h. m.	h. m.	h. m.	Per cent.
Aberdeen ..	523½	12 15	Up	East Coast Rlys. ..	11 05	13 30	2 25	1 10	10.5
,, ..	540	12 30	Down	West Coast Rlys. ..	11 15	N.S.	—	1 15	11.1
Birmingham ..	112††	††2 13	,,	G.W.R.	2 00	2 30	0 30	0 13	10.8
,, ..	113	2 15	Both	L. & N.W.R. ..	2 00	2 30	0 30	0 15	12.5
Bournemouth ..	108	2 15	Down	L. & S.W.R. ..	2 00	2 35	0 35	0 15	12.5
Bradford ..	193¼	4 15	Both	G.N.R.	3 56	4 50	0 54	0 19	8.0
,, ..	203½†	4 53	Up	Midland R.	4 13	5 55	1 42	0 40	15.8
,, ..	208	4 54	Down	G.C. & L. & Y. Rlys.	4 42	5 00	0 18	0 12	4.3
Brighton ..	51	1 00	Both	L. B. & S.C.R. ..	1 00	1 15	0 15	*Nil.*	0.0
Bristol	117¼*	2 05	Up	G.W.R.	2 00	2 15	0 15	0 05	4.2
Cardiff	145¼	2 55	Down	,, ...	2 50	3 10	0 20	0 05	2.9
Carlisle	299	6 03	,,	L. & N.W.R. ..	5 48	6 45	0 57	0 15	4.3
,, ...	309	6 38	,,	Midland R.	6 05	7 28	1 23	0 33	9.0
Edinburgh ..	393	8 30	Both	East Coast Rlys. ..	7 45	9 40	1 55	0 45	9.7
,, ..	400	8 40	Down	West Coast Rlys. ..	8 00	N.S.	—	0 40	8.3
,, ..	407¼	9 36	,,	Mid. and N.B. Rlys.	8 40	10 44	2 04	0 56	10.8
Exeter	173¾	3 13	Up	G.W.R.	3 00	3 30	0 30	0 13	7.3
,, ...	171¾	3 25	Both	L. & S.W.R. ..	3 14	3 57	0 43	0 11	5.7
Folkestone ..	70‡	1 25	,,	S.E. & C.R.	1 31‡	2 00	0 29	−0 06	−6.6
Glasgow ..	401½	8 30	Down	West Coast Rlys. ..	8 00	9 30	1 30	0 30	6.3
,, ..	424½	9 25	Both	Mid. & G. & S. Rlys.	8 45	10 40	1 55	0 40	7.6
,, ..	440½	9 45	Down	East Coast Rlys. ..	9 20	N.S.	—	0 25	4.4
Harrogate ..	204¶	4 40	Up	G.N. & N.E. Rlys. ..	4 00	5 20	1 20	0 40	16.7
,, ..	214¼	5 10	Down	Mid. & N.E. Rlys. ..	4 30	6 05	1 35	0 40	14.8
Hull	196¾	4 22	,,	G.N. & N.E. Rlys. ..	3 52	4 55	1 03	0 30	12.9
Inverness ..	567¾	14 10	,,	West Coast Rlys. ..	13 08	15 55	2 47	1 02	7.9
,, ..	558¾	14 50	,,	East Coast Rlys. ..	12 53	N.S.	—	1 57	14.0
Leeds	185¾	4 00	Both	G.N.R.	3 25	4 32	1 07	0 35	17.1
,, ...	196	4 10	Down	Midland R.	3 40	4 47	1 07	0 30	13.6
Leicester ..	99	1 55	Up	,, ...	1 45	2 15	0 30	0 10	9.5
,, ...	103	1 56	Down	G.C.R.	1 49	1 56	0 07	0 07	6.4
Liverpool ..	192¼	4 00	Both	L. & N.W.R. ..	3 35	4 45	1 10	0 25	11.6
Manchester ..	183½§	4 00	,,	,, ...	3 30	4 35	1 05	0 30	14.3
,, ..	189½	4 15	,,	Midland R.	3 40	5 08	1 28	0 35	15.9
,, ..	212	4 45	,,	G.C.R.	4 10	4 45	0 35	0 35	14.0
Margate ..	74	1 30	,,	S.E. & C.R.	0 30	2 03	0 33	*Nil.*	0.0
Newcastle ..	268½	5 39	,,	G.N. & N.E. Rlys. ..	5 13	5 55	0 42	0 26	8.3
Norwich ..	115	2 34	Down	G.E.R.	2 26	2 54	0 28	0 08	5.5
Nottingham ..	123½	2 24	,,	Midland R.	2 12	2 55	0 43	0 12	9.1
,, ..	126½	2 27	,,	G.C.R.	2 23	2 27	0 04	0 04	2.8
Parkeston Quay	69	1 22	,,	G.E.R.	1 22	2 04	0 42	*Nil.*	0.0
Penzance ..	305¼	6 45	,,	G.W.R.	6 30	7 55	1 25	0 15	3.8
Perth	449¾	9 45	,,	West Coast Rlys. ..	9 00	11 05	2 05	0 45	8.3
,, ...	440¾	10 16	,,	East Coast Rlys. ..	8 58	N.S.	—	1 18	14.5
Plymouth ..	225¾	4 23	,,	G.W.R.	4 07	5 00	0 53	0 16	6.5
Sheffield ..	164¾	3 22	,,	G.C.R.	2 57	3 22	0 25	0 25	14.1
,, ..	158¼	3 27	Up	Midland R.	3 00	4 01	1 01	0 27	15.0
Stoke	145½	2 50	,,	L. & N.W. & N.S. Rlys.	2 41	3 21	0 40	0 09	5.6
Whitehaven ..	311	7 55	,,	L. & N.W. & Fur. Rlys.	7 45	9 05	1 20	0 10	2.2
York	188	3 47	,,	G.N.R.	3 35	4 00	0 25	0 12	5.6

N.S.—No Through Service or Bookings. * Via Badminton. † Via Leeds.

‡ Ex Charing Cross. There was a service from Cannon Street (68¾ miles), August, 1914, in 83 min.

§ Shortest route, via Stoke. ‖ Central Station.

¶ Via Arthington and Leeds (Central).

†† Via Castlebar; 110½ miles via Park Royal (route followed by all 2¼-hour expresses but two on this service).

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TABLE B.—Runs of 100 miles or over Performed without Intermediate Stoppage.

Railway.(*x*)	Runs between	Distance.	No. of Runs.	Fastest			Total No. of Runs Daily.		
				Time.	Train.	Speed.	1914	1918	1921
		Miles.		Min.		m.p.h.			
G.W.R. ..	Paddington–Plymouth (*a*)	225.7	1	263	10.30 a.m., D.	51.5			
(225.7)	Paddington–Torquay	199.7	1	230	12.00 noon, D.	52.1			
	Newton Abbot–Paddington	193.9	1	220	12.25 p.m., U	52.9			
	Paddington–Exeter ..	173.7	2	193	1.47 p.m., U	54.0			
	Taunton–Paddington	142.9	2+1¶	158	¶4.00 p.m., D	54.3			
	Reading–Exeter ..	137.7	0+2‖	183	12.00 mdnt., U	45.1			
	Paddington–Newport	133.4	5	157	11.50 a.m., D	51.0	33	6	23
	Paddington-Worcester	120.5	1	135	1.30 p.m., D	53.6			
	Ealing-Wolverh'mpton	118.7	0+2*	140	10.02 a.m., D	50.9			
	Paddington–Bristol(*b*)	118.3	1	128	11.15 a.m., D	55.5			
	Bristol–Paddington(*c*)	117.6	2	125	12.00 noon, U 5.00 p.m., U	56.4			
	Paddington–Bath ..	106.9	4	113	1.00 p.m. D	56.8			
	Reading–Taunton ..	106.9	1+5§	120	2.50 p.m., D	53.5			
	Ealing–Birmingham ..	106.3	2††	121	10.02 a.m., D	52.7			
L. & N.W.R. (209.1)	Euston–Edge Hill ..	192.3	0+1†	223	11.30 a.m., D	51.7			
	Euston–Chester ..	179.2	0+1†	213	8.45 p.m., D	50.5			
	Euston–Crewe ..	158.1	7+1†	181	10.25 a.m., D 11.50 a.m., D 5.20 p.m., D	52.4			
	Crewe–Carlisle ..	141.0	6	168	1.15 p.m., D	50.4	41	10	19
	Stoke–Willesden Junc.	140.5	1	157	1.15 p.m., U	53.7			
	Euston–Stafford ..	133.6	4	149	12.41 p.m., U	53.8			
	Rugby–Edge Hill ..	109.7	0+1†	143	11.08 a.m., D	46.0			
	Wigan–Carlisle ..	105.2	1	131	12.07 a.m., D	48.2			
	Birmingh'm–Prestatyn	100.7	0+1*	142	12.15 p.m., D	42.6			
G.N.R. .. (175.7)	King's Cross–Grantham ..	105.5	16	121	5.30 p.m., D	52.3	22	6	16
N.E.R. .. (124.4)	Newcastle–Edinburgh	124.4	10	147	11.18 a.m., D	50.8	8	3	10
Midland R. (206.0)	St. Pancras–Nottingham	123.5	3	144	1.20 p.m., D 5.00 p.m., D	51.5	15	..	3
G.C.R. .. (164.7)	Marylebone-Leicester(*d*)	107.6	1	123	6.10 p.m., D	52.5	4	2	3
	Marylebone-Leicester(*e*)	103.1	2	116	3.15 p.m., D	53.3			
G.E.R. .. (130.2)	Liverpool Street–Gunton	134.0	0+1‡	190	12.20 p.m., D	42.3			
	Liverpool Street–Yarmouth	121.8	(‡)	..	..	..	7	..	2
	Liverpool Street–Beccles	109.2	2	147	9.55 a.m., D	44.6			
Cal. R. .. (111.0)	Carlisle–Glasgow ..	102.3	2	140	‡‡4.10 p.m., D	43.8	4	..	2
L. & S.W.R. (108.0)	..	..	..	..	..	..	4	..	..
Totals	.. .. ..	..	..	..	.. .. ..	..	138	27	78

Notes as to runs not made daily (not included in totals) :—

¶ Saturdays only : fastest daily time, 160 min., at 11.5 a.m., and 4.15 p.m., U. ‖ Excursions, Saturdays only. § Excursions, Fridays (3) and Saturdays (2) only. *Saturdays only. †† Not on Saturdays (included in totals). † Conditional boat train timings, when required. ‡ Conditional timings, when required. (*a*) North Road Station. (*b*) *via* Bath. (*c*) *via* Badminton. (*d*) *via* Wycombe. (*e*) *via* Aylesbury. ‡‡ This run includes conditional stop at Symington. (*x*) Figures in brackets in this column indicate longest run (miles) in 1914. D, down. U, Up.

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centage basis; while non-competitive lines all take the highest places. Omitting Exeter and Birmingham in the case of the Great Western Railway, for example, we find the non-competitive times of that railway only 4·3 per cent. in excess of pre-war standards, while the times shown on the Great Eastern, South Eastern and Chatham, and London, Brighton and South Coast Railway, on the average appear to have returned fully to pre-war level; against this the average percentage in the case of the five cities mentioned—the most important in England, London alone the week only, or conditionally) having only increased from 72 to 78, so that, in respect of 100-mile runs, we have still 43 per cent. of arrears to make up, as compared with pre-war summers. It is unlikely, however, that the pre-war position will ever be fully regained, as the eight-hours' day makes the return of enginemen and staff to their home station a matter of some difficulty on any run much exceeding three hours in duration. As a matter of interest, I have included various occasional runs in the tables, though not in the totals. In the case of

TABLE C.—LONGEST DAILY NON-STOP RUNS IN AUGUST, 1921, ON RAILWAYS HAVING NO RUNS EXCEEDING 100 MILES.

Railway.	Runs between	Distance.	No. of Runs.	Fastest Time.	Speed.	Fastest Train.	Longest run in Aug., 1914.
		Miles.		Min.	m.p.h.		Miles.
G. & S.W.R. ..	Kilmarnock-Carlisle ..	91.1	1	113	48.4	11.22 p.m., U.	91.1
L. & S.W.R. ..	Salisbury-Exeter ..	88.0	5	104	50.8	5 trains (*c*)	108.0
L.B. & S.C.R. ..	Victoria-Fratton ..	84.4	2	111	45.6	11.35 a.m., D.	84.4
S.E. & C.R. ..	Victoria-Dover Marine.	78.0	5(*b*)	103	45.4	10.54 a.m., D (*a*)	78.0
N.B.R.	Aberdeen-Dundee ..	71.3	1	99	43.2	7.15 p.m., U.	98.2
G.N.R. (I.) ..	Dubl.n-Dundalk ..	54.3	2	63	51.7	6.35 p.m., D.	33.3
G.S. & W.R. (I.) ..	Maryborough-Dublin	51.0	1	63	48.6	5.37 p.m., U.	86.8
M.G.W.R. (I.) ..	Dublin-Mullingar ..	50.0	6	74	40.5	5.6 p.m., U.	50.0
L. & Y.R. ..	Manchester-Wakefield	47.9	1	70	41.1	11.10 a.m., D.	47.9
Cambrian R. ..	Dovey Junct.-Welshpool	45.0	1	83	32.5	12.45 p.m., U.	34.0

(*a*) And at 11.0 a.m. down.
(*b*) Also many conditional up boat train timings by same route.
(*c*) In both directions.
U.—Up. D.—Down.

excepted—is still no less than 13·9 per cent. in arrears. By the time that these lines are in print, however, the 2-hour services between London and Birmingham may have been restored by both routes, and the writer believes that further early accelerations in other directions are contemplated. Additions to the table this year are Glasgow, Perth and Inverness by the East Coast route, Aberdeen and Edinburgh by the West Coast, and Edinburgh by Midland; but Plymouth, by the South Western route, drops out, no express service being now provided.

We now pass to Table "B." Here we find very little advance on the figures of last year, the total number of runs (other than those performed on certain days of the Great Western Railway, these consist principally of excursion trains, and are expressive of the excellent facilities once again offered by that company to the excursion passenger.

The London and North Western "conditionals" are mostly boat trains, and include two runs (Euston-Edge Hill, 192·3 miles, and Euston-Chester, 179·2 miles), both longer than any regular daily non-stop journey. As usual, there are a number of London and North Western runs nominally over 100 miles in length, but actually including stops intermediately for working purposes. Thus calls are made at Rugby by the 7.30 p.m. Euston-Crewe (9.5-9.8 p.m.) and by the 4.20 a.m. Crewe-Willesden (5.50-5.53 a.m.); the

12.30 and 1.10 a.m. expresses from Carlisle to Crewe call respectively at Carnforth (1.55-1.57 a.m.) and Preston (3.5-3.8 a.m.), and the 10.45 p.m. Crewe-Carlisle also at the latter place (11.46-11.49 p.m.); while the 1.18 a.m. Crewe-Holyhead calls at Chester from 1.46 to 1.48 a.m., incidentally cutting the North Wales line completely out of this table. But on the main line proper the number of such stops is considerably reduced—the actual reduction is from 11 to 6—and the increase of London and North Western 100-mile runs from another long non-stop stretch covered by two expresses every day; in the same category might also be mentioned, on the Great Western Railway, Reading-Newport, 97·4 miles (four trains), Paddington-Westbury, 95·6 miles, and Paddington-Chippenham, 94 miles; on the London and North Western Railway, Euston-Nuneaton, 97·1 miles, Crewe-Northampton, 94·6 miles, and Euston-Coventry, 94 miles (seven trains). The Caledonian Railway might appear, by the public time-tables, to have more 100-mile runs

TABLE D.—Fastest Runs on Leading Railways in 1914 and 1921.

Railway.	In August, 1920.						(*g*)In 1914 Speed m.p.h.
	Train.	From	To	Miles.	Minutes.	Speed m.p.h.	
Caledonian R.	4.35 p.m.	Forfar	Perth	32·5	34	57·4	57·4
G.W.R. ..	9.43 a.m.	High Wycombe	Banbury ..	41·0	43	57·2	59·2
G.C.R. ..	4.13 a.m.	Rugby	Leicester ..	19·9	21	56·9	61·3
Midland R. ..	12.31 p.m.	Appleby ..	Carlisle ..	30·8	33	56·0	56·8
L. & N.W.R.	1.7 p.m. (*a*)	Coventry ..	Willesden ..	88.6	96	55·4	57·7
S.E. & C.R. ..	6.0 p.m.	Tonbridge ..	Folkestone ..	40·5	44	55·2	54·8
L. & S.W.R. ..	5.25 p.m.	Basingstoke ..	Surbiton ..	35·8	39	55·1	57·2
N.E.R. ..	9.22 p.m.	Clifton Jct. (*e*) ..	Darlington ..	43·8	48	54·8	61·7
G.N.R. ..	12.21 p.m.(*b*)	Grantham ..	Doncaster ..	50·5	56	54·1	57·5
G.N.R. (I.) ..	6.45 a.m.	Dublin	Drogheda ..	31·8	36	53·0	50·0
G.E.R. ..	5.55 a.m.	Shenfield ..	Rochford ..	18.5	21	52.9	52.9
L.B. & S.C.R.	5 trains (*d*)	Victoria	Brighton ..	51·0	60	51·0	51·0
C.L.C. ..	6.7 p.m. (*f*)	Cheadle Heath ..	Liverpool ..	36·4	43	50.8	51·7
G. & S.W.R.	5.12 p.m.(*c*)	Dumfries ..	Kilmarnock ..	58.1	69	50.5	54.6
N.B.R. ..	7.57 a.m.	Lenzie	Falkirk ..	15·5	19	49.0	52.3
L. & Y.R. ..	21 trains (*d*)	Liverpool ..	Manchester ..	36·5	45	48.7	54·7
G.S.&W.R. (I.)	5.37 p.m.	Maryborough ..	Dublin ..	51·0	63	48.6	51·9
G.N.S.R. ..	8.45 a.m.	Ballater	Aboyne ..	11·0	14	47.1	47.1
N.S.R. ..	12.43 p.m.	Macclesfield ..	Stoke ..	19·8	27	44.0	44.0
Highland R.	6.25 p.m.	Blair Atholl ..	Perth ..	35·3	50	42·3	41·5

(*a*) And at 6.47 p.m. both directions. (*b*) And at 7.52 p.m. (*c*) And at 7.33 p.m. (*d*) In (*e*) North end of York Station. (*f*) Worked by Midland Co. (*g*) Not necessarily over the same route.

14 in 1920 to 18 in 1921 now brings this company once more above the Great Northern Railway.

This year the Great Eastern Railway has only had two 100-mile journeys scheduled daily, instead of five last year, and so falls below the Great Central and Midland Railways. The last-mentioned company is, as usual, unfortunate, in that the 99-mile St. Pancras-Leicester run falls short of inclusion by one mile only; 14 trains in all make this break daily. Leicester-Leeds, 97 miles, is than those shown in the table, but all the other journeys include definitely booked stops; the 1.47 and 2.30 a.m. Carlisle-Stirling call at Beattock for assistance at 2.35-2.38 and 3.18-3.21 a.m. respectively, and the latter, in addition, at Motherwell, 4.13-4.18 a.m.; the 6.55 a.m. Carlisle-Glasgow at Beattock, 7.51-7.54 a.m., and the 10 a.m. Glasgow-Carlisle conditionally at Motherwell, and regularly at Symington at 10.58-11.2 a.m., to attach the Edinburgh portion. The London and South Western Railway is still the only

line which figured in the pre-war 100-mile run table, but no longer does so.

Table "C" is designed to cover the railways which do not attain to the 100-mile level, and requires little in the way of comment. In the case of the Lancashire and Yorkshire Railway, in order to conform to the general principle of tabulating regular daily running only, I have replaced the weekly runs between West Riding towns Bridge-Lytham, 50·4 miles. It is interesting to note that the fastest run in this table is made by an Irish railway—the progressive Great Northern—which has this summer reinstated non-stop bookings between Dublin and Dundalk.

To the average reader Table "D" is doubtless the one which makes the most potent appeal. In this table, by comparison with last year, a substantial

TABLE E.—RESTAURANT AND PULLMAN CAR TRAINS IN 1914, 1918 AND 1921.

Railway.	Restaurant Car Trains.			¶ Tea Car Trains.	Pullman car Trains.	Totals.		
	Worked.	Jointly Worked.	Worked by Foreign Cos.			July, 1914.	Oct., 1918.	Aug., 1921.
G.W.R.	66	—	7	5	—	88	—	78
L. & N.W.R. ..	42	12	2	6	—	80	—	62
G.E.R.	38	—	1	—	22	35	4	†51
Midland R. ..	43	6	—	—	—	64	20	49
L.B. & S.C.R. ..	—	—	—	—	46	44	20	46
L. & S.W.R. ..	37	—	1	4	—	36	12	42
Caledonian R. ..	—	14	—	—	‡27	23	—	41
N.E.R.	8	10	14	—	—	42	—	32
N.B.R.	18	8	2	—	—	40	—	28
S.E. & C.R. ..	—	—	—	—	26	17	—	26
G.N.R.	14	10	—	—	—	34	—	24
G.C.R.	15	—	3	—	—	22	8	18
L. & Y.R.	6	—	10	—	—	22	2	16
G.N.R. (I.) ..	6	—	—	4	—	4	8	10
Metropolitan R. ..	—	—	—	—	10	10	—	10
Cambr an R. ..	—	—	2	4	—	—	—	6
G. & S.W.R. ..	4	4	—	—	—	10	2	8
G.S. & W.R. (I.) ..	4	—	—	—	—	6	—	4
D. & S.E.R. (I.) ..	2	—	2	—	—	4	—	4
M.G.W.R. (I.) ..	2	—	—	—	—	3	—	2
N.C.C. (I.)	—	—	—	—	—	2	—	—
*Grand totals ..	305	30	—	23	131	475	72	479

* These totals do not include the same cars more than once when they run over more than one system.

† Total reduced by 10 in that 10 trains carry both Pullman and restaurant cars in their formations.

‡ Includes 13 restaurant car services, 1st and 3rd class, operated by Pullman Co.

¶ Trains in which teas are served from a small compartment kitchen, and not in a restaurant car.

and Blackpool by the daily run of the east-bound Liverpool-Newcastle "diner" between Manchester and Wakefield. The longer journeys just referred to, which take effect on Saturdays only, are Halifax-Waterloo Road, via Todmorden (Hall Royd Junction), Rose Grove, Accrington, Blackburn, Farington curve, Preston and New Line, 59·6 miles; Sowerby Bridge-Waterloo Road, 56·5 miles, and Hebden

advance has been made. Before the war the average speed of the best runs on the 20 railways shown worked out at 53·8 m.p.h.; last year the average had recovered to 51·3 m.p.h., and this year it reaches 52·0 m.p.h. Nine railways are now found above the 54 m.p.h. limit, as against 7 last year and 11 before the war. The Caledonian Railway still takes the premier place, but the Great Western

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now ousts the Great Central from the second place, the latter falling to third. A deceleration by only 1 min. of the 5.30 p.m. express from King's Cross to Newcastle, as between Clifton Junction at York and Darlington, carries the North Eastern Railway down to the eighth, instead of the fourth place—a tragic fate for the line which before and during the war so long held the premier position.

On the other hand, the London and North Western now ascends from tenth bracketed with the South Eastern and Chatham Railway in the sixth place, as the 2.55 p.m. from Billericay is still booked to cover the 4·6 miles thence to Wickford start-to-stop in 5 min., at 55·2 m.p.h., but as this is an utterly impossible feat—even with all allowance for the falling gradient—I have again substituted the more practical Shenfield-Prittlewell journey.

The South Eastern and Chatham 55·2 m.p.h. run, performed by the Folkestone portion of the 5.10 p.m. express *ex-*

TABLE F.—SLIP COACHES IN 1914, 1918 and 1921.

Railway.	Where detached (No. daily in brackets).	Total No. detached.		
		1921.	1918.	1914.
G.W.R.	Reading (5), Westbury (4), Taunton (2), Princes Risborough (2), Taplow (1), Twyford (1), Didcot (1), Chippenham (1), Bath (1), Bridgwater (1), Kingham (1), Moreton-in-Marsh (1)	21	—	70
L.B. & S.C.R. ..	Hayward's Heath (6), Polegate (4), Preston Park (3), Sutton (1), Horley (1), Ashurst (1), Barnham Junction (1)	17	2	21
L. & Y.R.	Accrington (2), Rochdale (1), Midge Hall (1), Todmorden (1), Blackburn (1)	6	4	7
S.E. & C.R. ..	Faversham (2), Ashford (1), Swanley (1), Herne Hill (1)	5	—	8
G.N.R. (I.) ..	Dogheda (2), Goraghwood (1), Lisburn (1) ..	4	—	—
G.E.R.	Broxbourne (1), Witham (1)	2	—	14
G.S. & W.R. (I.) ..	Sallins (1), Kildare (1)	2	1	6
G.C.R.	Brackley (1)	1	—	4
M.G.W.R. (I.) ..	Enfield (1)	1	2	1
Eskdale R. ..	Irton Road (1)	1	—	—
Midland R. ..	.. ..	—	—	18
L. & N.W.R. ..	.. ..	—	—	16
Caledonian R. ..	.. ..	—	—	10
G.N.R.	.. ..	—	—	1
Totals	.. ..	60	9	176

to fifth place, in virtue of the smart booking of two of the Birmingham-Euston expresses, which include stops at both Coventry and Willesden in the 2¼ hours' schedule. These runs are, by a substantial margin, the longest figuring in this table; most of the journeys are sharp timings of expresses over short and favourably-graded stretches of line. In contra-distinction to the North Eastern Railway slowing, an acceleration by 1 min. of the Midland mid-day run from Appleby down to Carlisle raises that company from sixth place to fourth. Strictly speaking, the Great Eastern Railway should be Charing Cross, is a notable piece of work over a route which, while easy, is by no means exclusively in favour of the engine. As compared with last year, the London and South Western Railway rises from twelfth to seventh place, in virtue of the extensive accelerations brought into force this summer; the run tabled should, however, be fairly easy of accomplishment, as the course is mostly favourable to the engine. It seems somewhat curious to find a line with such speed propensities as the English Great Northern in the ninth place. Three other companies by their accelerations of this summer have

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now moved to higher positions over the head of the Great Northern Railway. By their 1921 quickenings the London, Brighton and South Coast and the Glasgow and South Western Railways now ascend above the 50 m.p.h. limit. The Lancashire and Yorkshire, North British, and Great Southern and Western of Ireland Railways are the only lines not so distinguished, which, nevertheless, could show 50 m.p.h. runs in 1914.

Table "E" alone supplies evidence of a return to more than pre-war facilities. Actually there are now a greater number of restaurant and Pullman car trains than there were in 1914—a striking testimony to the recuperative powers of British railways after four years of war, and during a period of 2½ years only. It is in Pullman car trains that by far the greatest increase is shown since last year; the figure of 84 has grown to 118, or by 40 per cent., principally in virtue of the new services on the Great Eastern Railway. At the same time an enhancement of the totals of both types of car by 79—from 400 to 479—is a remarkable achievement in a single year. As usual, I have included the joint and "foreign" workings in the individual totals of each company concerned, but not in the grand totals; that is to say, no single train figures more than once in the aggregate. This will explain why an addition of the individual railway totals in 1914 produces a higher figure than the same addition in 1921, even though the number of trains operating was then five less; there were in 1914 more through and joint workings than in 1921, each of which was included in the totals of two or three companies over whose systems they ran. It should also be borne in mind that, in view of the smaller total number of express trains now operating than in 1914, the percentage frequency of Pullman and restaurant car trains is considerably higher in 1921; generally speaking, indeed, it is safe to say that, on the majority of lines, no express train is now run without such equipment, while increasing numbers of semi-fast trains also carry creature comforts of this nature.

The Great Western and London and North Western Railways, of course, head the list, but it is truly astonishing, and to the greatest credit of that company, to find the Great Eastern coming third. Ten trains on the latter system now carry both Pullman and restaurant cars in the same formation, but, although the operation of the two types of car is quite distinct, in the totals I have considered both as one working only. It is from eighth place in 1914 and sixth in 1920 that the Great Eastern Railway now moves to third, coming now even ahead of the Midland. Credit also attaches to the London, Brighton and South Coast and London and South Western Railways for their high positions, in comparison, say, with the Great Northern Railway, down in the tenth place.

In connection with this table, interest is generally evinced in the foreign workings, and these may be recapitulated briefly. The Great Western seven is made up of two out of the four Liverpool-Plymouth workings (London and North Western Railway); both directions of the Birkenhead-Bournemouth service (London and South Western Railway) and of the Sheffield-Bournemouth service (London and South Western Railway and Great Central Railway), and one direction daily of the Newcastle-Swansea working (Great Central Railway). On the London and North Western Railway the two shown represents the complementary Great Western Railway working of the Plymouth-Liverpool cars. One direction of the Harwich-Liverpool boat train, worked by a Great Central car, figures as "foreign" on the Great Eastern Railway, also the Great Central Company's operation of a car between Sheffield and Bournemouth, on the London and South Western Railway. As always, the North Eastern Railway total includes a large number of foreign workings; the figure 14 shown is made up of Bristol (Midland) and Harwich (Great Eastern) workings into and out of York; Swansea (Great Western and Great Central) and Liverpool (Lancashire and Yorkshire) cars into and out of Newcastle, and Great Northern Railway workings between Doncaster and Hull, Harrogate and Scarborough, in both directions.

Two "foreigners" on the North British Railway are the North Eastern services in both directions between Newcastle and Glasgow. Ten foreign restaurant car trains figure daily in the Lancashire and Yorkshire total—two West Coast cars in

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each direction between Preston and Liverpool, a Midland "set" into and out of Manchester (Victoria), and another to and fro between Thornhill and Bradford (Exchange), and one Great Central car each way between Penistone and Bradford. Until recently there were two of the latter, but one London car now terminates at and starts from Sheffield. Lastly, there are the return workings of the Great Western Paddington car to and from Aberystwith (Cambrian Railway), and the Great Southern and Western Queenstown car to and from Kingstown (Dublin and South Eastern Railway). Altogether the restaurant and Pullman car table is one of which British railways may well be proud.

This year, for the first time, I have added a sixth table—"F"—which sets out the number of slip coaches now operating. There has been a distinct recrudescence of slip coach activity this summer, although we are still far from the number which used to be detached daily in pre-war days. Indeed, the Midland, London and North Western and Caledonian Railways appear to have abandoned the practice altogether, while the Great Western and Great Eastern totals are only a fraction of those of the pre-war era. The reason for this decline is, of course, simple enough: a slip coach inevitably means the provision of an extra guard, who in these days of increased wages and shorter hours is a much more expensive personage than hitherto. The London, Brighton and South Coast totals are now fairly near those of 1914, and the Lancashire and Yorkshire Railway has returned practically to pre-war figures; the Eskdale Railway appears for the first time, and is probably the first narrow-gauge railway that has ever gone to the length of slipping coaches *en route*.

In concluding this analysis of the summer train services of 1921, it is interesting to speculate as to what form an article of this character will require to take in future years. It may still be possible in 1922 to present data of this character, but the grouping which is to come into force at the beginning of 1923 must inevitably curtail to some extent the interest found in thus comparing the speeds and general facilities offered by the numerous railways of to-day.

0-6-0 LOCOMOTIVE, CAMBRIAN RAILWAYS.

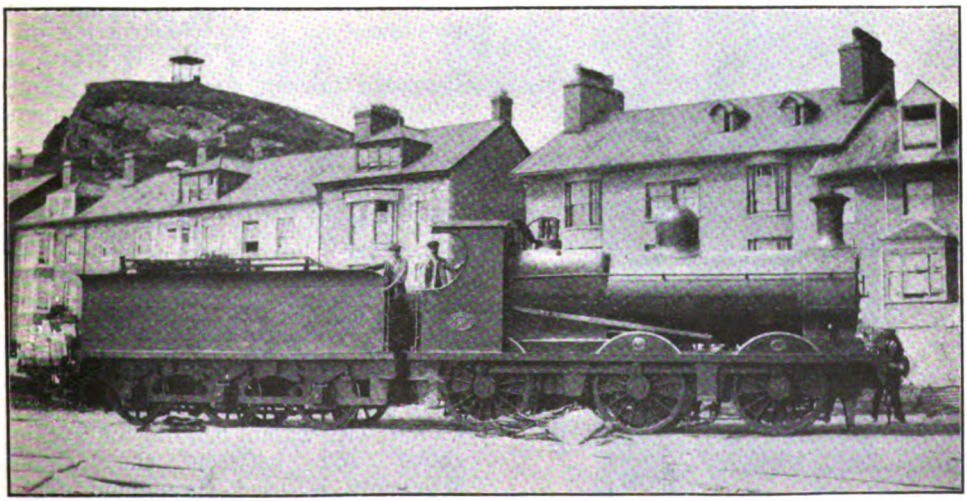

Photo.] No. 91, ON SANDS SIDING, ABERDOVEY. [*H. W. Burman.*

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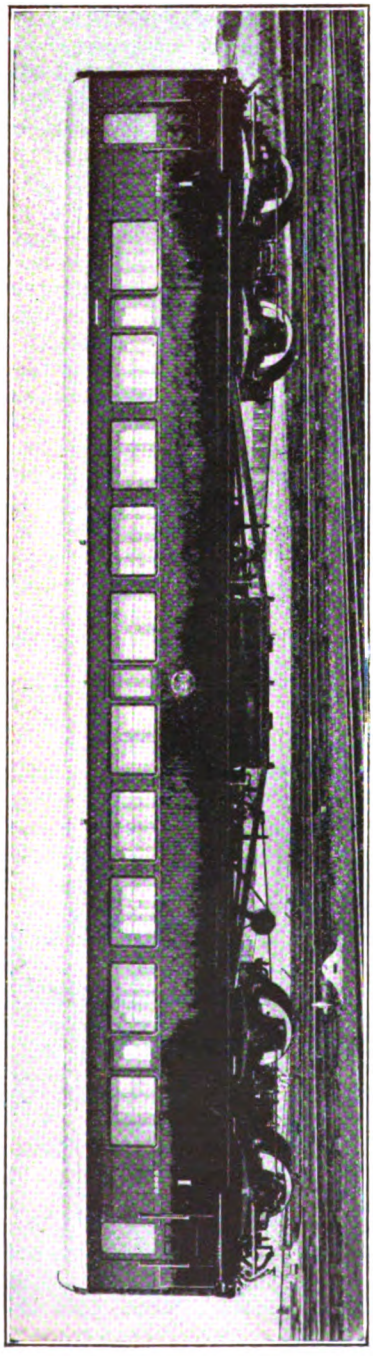
New Rolling-stock for Continental Boat Trains, South Eastern and Chatham Railway.



NEW FIRST-CLASS CORRIDOR VESTIBULED CARRIAGE FOR USE IN CONTINENTAL BOAT EXPRESS TRAINS, SOUTH EASTERN AND CHATHAM RAILWAY.

FOR the continental boat expresses, a train of corridor stock has recently been built at Ashford to the designs of Mr. R. E. L. Maunsell, C.B.E., Chief Mechanical Engineer, to whose courtesy we are indebted for the accompanying illustration and particulars. This train represents a departure from existing practice, as hitherto non-corridor stock has been used for the Continental boat trains.

The carriages each measure 64 ft. over the gangways, and have been constructed to work in conjunction with Pullman Cars, being fitted with Pullman type gangways, automatic couplers and draft gear, also adjustable side buffers for working with ordinary stock when necessary. Vehicles of the following classes are used for making up these trains: First-class, second-class, brake first-class and brake second-class.

It will be noted that the stock is fitted with end vestibule doors only, and advantage has been taken of this to introduce straight sides below the bottom light rail. The underframes are built of standard rolled-steel sections, and have two angle-bar trusses each. The truss bars are not adjustable, but the extension of the truss when the body is placed on the underframe is allowed for in the construction of the latter. The bogies have steel-plate sole-bars with transoms and bolsters of standard rolled-steel sections, and the arrangement of the springs represents the most recent practice. The side bearing and bolster springs are of the laminated and helical types respectively. Special attention is paid to parts liable to wear, such as bolster suspension links and brake gear with the objects of minimising repairs.

The interior of the first-class compartments is finished in walnut, relieved with sycamore panels, and the corridors of these carriages have a "dado" of slatted walnut, with walnut banding and sycamore above and between the windows. Mahogany is used throughout for the second-class carriages, the corridors of which are slatted, and in the compart-

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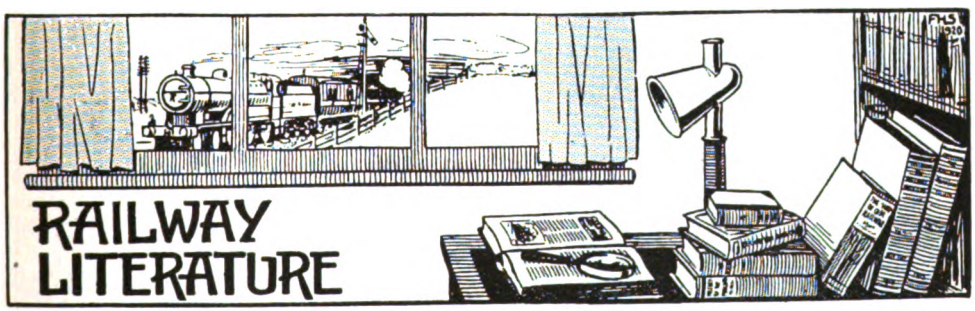
ments relief made by painting the panels "flat white." The roofs of all compartments are also painted "flat white."

The upholstering for first-class compartments is green corded cloth with valance and cording to match. The floors of the compartments are covered with "Tournay" rugs, and that of the corridor with bordered linoleum. With a view to the comfort of passengers, special attention has been given to the design of the seats and backs. The second-class compartments are trimmed in red, black and orange velvet, and the floors are covered with bordered Brussels carpet. Copper oxidised fittings are used throughout the train.

All compartments are fitted with portable tables to enable passengers to be served with refreshments from the Pullman cars during a journey, for which purpose electric bell communication is provided between all carriages and the Pullman cars.

The electric lighting equipment is Vickers single battery system, and each coach has a self-contained installation. Master switches are provided in the guards' compartments to control the lighting, and in the first-class compartments corner lamps are arranged over each seat, separately controlled by switches placed immediately below the lamps.

Exteriorly the new vehicles are painted with the company's standard brown, relieved by gold lines, bearing also the class number and the carriage number at the entrance of the vestibule doors, and the Managing Committee's Coat of Arms at the centre.



UNIVERSAL DIRECTORY OF RAILWAY OFFICIALS, 1921. [The Directory Publishing Company, Limited, Queen Anne's Chambers, Westminster, S.W.1. Price 20*s.* net.]

The 27th annual edition of this useful work has just been published. All the features which have contributed to the appreciation of previous volumes have been retained and the general style throughout is similar. Owing to the stress of war, the last few volumes have not been able to include official information with regard to the personnel of some of the railways, especially in Central Europe, but in this issue particulars relating to many railways not available since 1914 are included. The Universal Directory well justifies its title in that it provides particulars of gauge, mileage and rolling-stock, together with the names of the directors, chief and district officers of the railways of all countries. In addition, telegraphic addresses and telephone numbers are given, while in the case of foreign railways the name is usually given in the language concerned, as well as in its English equivalent. The indices, which appear together at the back of the book, are, as usual, exceptionally well arranged, and comprise in sequence an index to countries, an index to names of railways, tramways, &c. (25 pages), and a personal index of railway officials (95 pages), these sufficing to show the comprehensive nature of the work.

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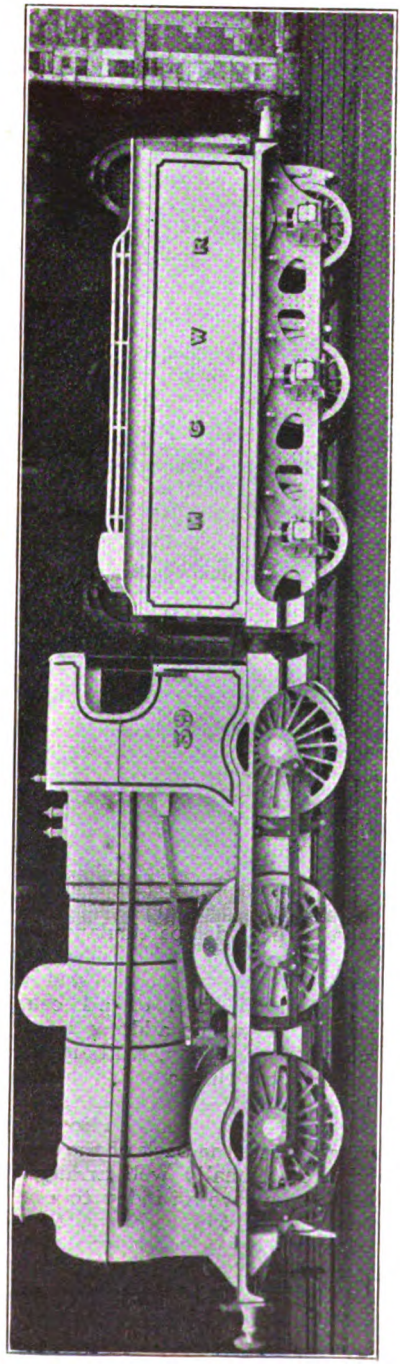
0-6-0 Mixed Traffic Locomotive, Midland Great Western Railway of Ireland.



NEW 0-6-0 LOCOMOTIVE, MIDLAND GREAT WESTERN RAILWAY OF IRELAND.

MR. W. H. MORTON, Locomotive Superintendent.

THESE locomotives, three of which are in service and 10 building, have been designed to meet the special requirements of the Midland Great Western Railway, for working fast live-stock specials and other express goods trains, the proportions and weights being limited to suit all branches of the system. The total engine weight of 48 tons is utilised for adhesion, and the tractive force at 85 per cent. boiler pressure, 20,500 lb. Weight in working order, with tender, is 80 tons. Water capacity of tender is 2,800 gallons, coal, 7 tons.

The leading particulars are as follows :—

Cylinders	19 in. diam. by 26-in. stroke.
Wheels	5 ft. 8 in. diam.
Rigid wheelbase	15 ft.
Heating surface—	
Tubes	821 sq. ft.
Firebox	126 sq. ft.
Total water heating surface	947 sq. ft.
Superheater (internal area)	210 sq. ft.
Grate area	17·3 sq. ft.
Boiler pressure	175 lb. per square inch.

The cylinders are set at an angle of 1 in 9½ to the horizontal, situated between the frames. They are fitted with 8-in. diam. piston valves with inside admission operated by Stephenson link motion. The engine is fitted with combination ejector, steam brake on engine, and continuous vacuum brake on tender. It is also fitted with steam sanding on driving wheels, with gravity sanding for reverse running, a four-feed Detroit lubricator for valves and pistons. Steam heating is also fitted, so that the engines may be used for heavy excursion traffic when required. It is of interest to note that these engines are the first introduced in Ireland, expressly designed for mixed traffic working.

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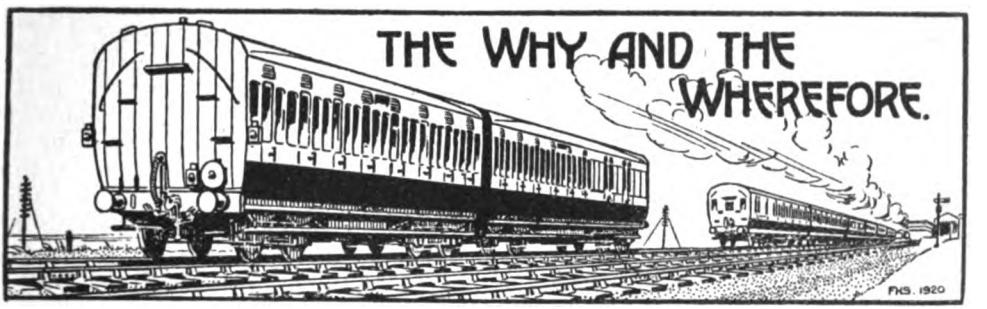

RAILWAY MAGAZINE *readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to locomotive sheds and to the dimensions of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. Queries respecting British Locomotive Practice and Performance should be sent to Mr. Cecil J. Allen, c/o* **RAILWAY MAGAZINE**, *30, Fetter Lane, Fleet Street, London, E.C.4. Queries should not be of purely local interest. No reader should forward more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history and the like, readers should consult the pages of the "Railway Year Book." The twenty-fourth Annual Edition of this standard railway reference work is now on sale, 5s. net, or by post from the* **RAILWAY MAGAZINE** *Offices, 5s. 9d.*

The Moreton Tramway.

Mr. T. R. Perkins, who wrote the article published in the RAILWAY MAGAZINE for October, 1902, and to whom your query has been referred, replies that he cannot record any recent developments. The rails were removed from the Longdon Road—Stratford portion three years ago, and the weighbridge at Stratford has since been dismantled. Nothing now remains but the grass-grown track, which can easily be traced. From Stratford to Newbould it keeps close company with the main Birmingham—Oxford road, diverging just after crossing the Stour at the latter place (Newbould), and joining the present Shipston branch near Longdon Road Station. When the line was dismantled, two lengths of rail were presented by the Great Western Railway Company to the town of Henley-in-Arden, and may there be seen—fastened to the original stone sleepers—in the garden of the Guild House. Another short piece of track was placed in the Bancroft Gardens at Stratford-on-Avon; so that although the old line is now taken up its character can still be studied from the relics preserved. The chairs bear the initials "F.R.," showing that they were made by Foster and Rastrick, of Stourbridge, who built the *Agenoria* for the Shutt End Railway (the first locomotive to run in the Midlands). The weighbridge at Stratford also bore their name. The rails are said to have come from Bedlington in Northumberland, and are of the fish bellied type, in 15-ft. lengths. It is believed that some of the stone sleepers are still *in situ*, though rails and chairs have gone.

[Reply to G. W. BISHOP.]

"The Most Fashionable Train."

This query takes a somewhat peculiar form, but on the basis explained in your letter, while special Sunday trains such as the "Southern Belle" on the London, Brighton and South Coast Railway, and the "Thanet Limited" on the South Eastern and Chatham Railway, might claim this title to some extent, it will usually be found that on nearly every route where long distance residential traffic is catered for on a considerable scale, there is one train which carries an unusually large proportion of first-class travellers. The "City" express of the London, Brighton and South Coast Railway, leaving London Bridge at 5 p.m. was for a long period first class only, and this is still in many respects a first-class train. Between Manchester and Blackpool first-class season ticket-holders require to be liberally catered for, as also on the Llandudno "Club" train on the London and North Western Railway. There are, however, many answers to your query,

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including the train mentioned by you, the 5.3 p.m. from Glasgow (St. Enoch) for Bridge of Weir, and Kilmacolm, with 27 first-class compartments.

[Reply to R.W.]

Hitchin-Cambridge Lines, Great Northern Railway.

According to the *Great Eastern Railway Magazine*, this line was opened: Hitchin-Royston, October 21, 1850; Royston-Shepreth, August 1, 1851; and thence to Cambridge, April 1, 1852; and as you point out this does not agree with the RAILWAY YEAR BOOK. The statement in question in the latter was based upon apparently reliable information though from a different source, but as the particulars above given are specific in detail, they may be accepted, in default of extended research, as probably more correct, although it must be remembered that even official records often differ materially, and much depends upon whether the date of opening stated is for goods traffic, for passenger traffic, of a formal ceremony, or when through trains were introduced. Variations of interpretation, indeed, account for many contradictory assertions which have given rise to considerable controversy.

[Reply to H. V. BORLEY.]

Automatic Signalling.

In a full-automatic system of signalling of any length, a train entering is described in the ordinary way from one end of the automatic section to the other; the signalman at the far end keeps a record of these descriptions, and marks the trains off as they pass, a special series of coloured markers working in a slot being often employed for this purpose. As the portion of line automatically signalled must be track-circuited throughout, the breakage of a train would result in the detached portion keeping the signals in rear at danger; for the same reason a train running away on the wrong line would automatically put the signals to danger in front of it. All the automatically-signalled sections are also indicated visually in the signal-boxes at both ends of the automatically-signalled stretch, so that the signalmen are fully aware of all that goes on.

[Reply to "AUTOMATIC SIGNALLING."]

Signal Alterations on the London, Brighton & South Coast Railway.

Apart from local knowledge it is not possible to explain the reasons for the alterations to signals between Balham and Streatham Common to which you refer, but obviously they were made with due recognition of "sighting" requirements and clearness of observation. Apparently the up main line signals were removed from the large group of signals to avoid risk of confusion between up main and up local, and although the former is now on a single low post, and appears to be partially obscured by an overbridge, it can no doubt be clearly seen through the bridge, and notwithstanding the curve, though that may not be the case with the up local signal. Alterations of this kind are usually made only after special observation tests and investigations.

[Reply to "CHEMIN-DE-FER."]

Yellow Distant Signals.

These are more correctly "repeaters," as they merely indicate the position of the next stop signal and do not strictly accord with ordinary signalling where a clear distant signal shows that a path is clear through the complete set of signals at the block post ahead. In three-position signalling the two arms are, as it were, combined: at 45 degrees "caution," signifies that the next signal is at danger (equivalent to an adverse distant); at right angles that the next signal is clear, and that a clear distant would be shown were there a separate arm.

[Reply to G. N. SOUTHERDEN.]

South Eastern & Chatham Railway Locomotives.

The 440-459 class of 4-4-0 engines were the last built for passenger service by Mr. James Stirling. They were domeless, but had square-type cabs. No others of the class were constructed, and all have since been rebuilt. We cannot say how many of the Stirling 4-4-0 and 0-6-0 engines still retain domeless boilers. Apart from Mr. Ahrons' articles on South Eastern Railway Locomotives—see RAILWAY MAGAZINE, June, July and August, 1917—Mr. J. F. Gairns described all the modern classes in the February, 1913, number, but without giving lists of numbers, &c., as to which we cannot assist you.

[Reply to L. G. PEGRAM.]

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London-Dundee Train Services.

You must blame the "allocation" system for the limited through and sleeping car facilities during the post-war period; but it may be pointed out that though there may not be so many through carriages or sleeping cars the journey facilities are not so inferior. Considerable improvements may, however, be expected in due course. It may be pointed out that Perth would hardly be so well served were it not for the fact that it is the centre for traffic between England, Glasgow and Edinburgh for the Highland system.

[Reply to O. M. M.]

Locomotives on War Service.

Information as to the numbers of locomotives sent overseas by the home railway companies has been given in various "Pertinent Paragraphs," dealing with the war services of each, published during the past two years. They numbered about 700, and were mainly of 0-6-0 types, with a few 0-8-0's. (London and North Western Railway and North Eastern Railway), 2-8-0's. (Great Central Railway), 2-6-0's. (Great Western Railway), and 0-6-2 T (London, Brighton and South Coast Railway).

[Reply to F. L. HARRIS.]

The Railways Act, 1921.

The grouping proposals, both as originally proposed and as amended during proceedings in Parliament, have been fully set forth in the RAILWAY MAGAZINE, and are further dealt with in "Pertinent Paragraphs" in this issue. A leading principle is that the railways are grouped as companies and that no sections are transferred from one to another, which is responsible for many anomalies, but avoids all the difficulties and complexities which adjustment would involve.

[Reply to L. DICKS.]

The "Races" to Scotland.

Fastest time to Edinburgh in the 1888 race was made by the East Coast route, the 10.0 a.m. train from King's Cross reaching Edinburgh at 5.26¾ p.m.—393 miles in 446¾ min., including 36 min. standing at stations—on August 31; in the 1895 race the West Coast 8 p.m. from Euston reached Aberdeen at 4.32 a.m.—540 miles in 512 min., or 503½ min. actual running time—on August 22 of that year.

[Reply to "ATLANTIC."]

4-2-2 Locomotives, Midland Railway.

Although hardly in accordance with the rules governing the "Why and Wherefore" section, in view of the interest taken in these famous locomotives we shall be pleased to mention particulars supplied by readers as to the whereabouts of the Midland "single" engines still in service. You state that Nos. 604 and 668 were seen at the Midland shed at Gloucester, while No. 600 is usually employed for working the official saloon.

[Reply to A. R. HARRISON.]

Locomotive Balancing.

The reply to J. G. F. on page 117 of the August RAILWAY MAGAZINE was based on the idea that balancing, as understood in locomotive engineering, is to counterbalance reciprocating forces and movements. Nothing of that kind applies, of course, in reference to carriage wheels, but, as you point out, it is necessary to correct for small irregularities of construction by means of small plates attached as required.

[Reply to E. C. POULTNEY.]

Cheshire Lines Committee.

The RAILWAY YEAR BOOK explains fully that this joint system, though worked substantially as a distinct railway, has no locomotives of its own. The Great Northern and Midland Railways work some of the trains, and the Great Central Railway provides power for the remainder; 580 coaching vehicles are owned by the Committee, also, 4,419 goods vehicles and 91 service vehicles.

[Reply to J. C. and P. H. S. DREW].

North Eastern *v.* North British 4-4-2 Express Locomotives.

In view of the guarded qualifying references included with this reply, your suggestion that inaccuracy is involved does not appear to be justified. Introduction of the "boiler demand factor" at equal speeds in revolutions per minute, and allowance for the respective evaporative surface areas, may alter the comparative results, but this was fully realised when the answer was written.

[Reply to E. C. POULTNEY.]

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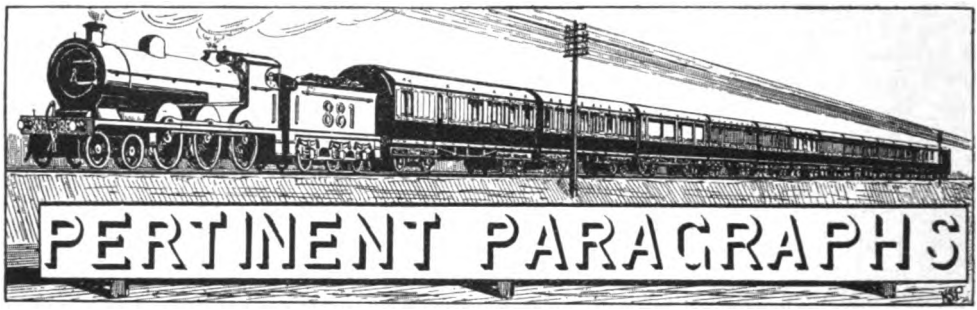

Three-Cylinder 4-6-0 Express Passenger Locomotive, Caledonian Railway.

PARTICULARS were given in the RAILWAY MAGAZINE for March, 1921, with a diagram, of a new 4-6-0 class of express passenger locomotive for heavy main line work, to the designs of Mr. W. Pickersgill, C.B.E., Chief Mechanical Engineer, Caledonian Railway, then under construction. The first of these is now at work, and by courtesy of Mr. Pickersgill we are enabled to illustrate it as frontispiece and to give further information.

The three-cylinder principle of locomotive design is now firmly established, but these engines are the first to incorporate it on a Scottish railway, and in view of the steep gradients to be surmounted and the great weights to which many of the principal expresses on the Caledonian Railway regularly attain, there is every justification for Mr. Pickersgill to develop his earlier practice in this manner. With the moderate coupled wheel diameter of 6 ft. 1in., and the necessarily very large boiler provided to supply three 18½ in. long by 26 in. cylinders, these engines, now the heaviest 4-6-0's in service in the United Kingdom, should be capable of remarkable work. In several respects the design is a departure from the older Caledonian standards, but the engines give an impression of remarkable power capabilities, and also maintain a considerable degree of elegance of outline and workmanlike appearance.

The outside cylinders drive the second coupled axle through 11 ft. connecting rods, the piston rods being lengthened. The inside cylinder actuates the leading coupled axle. Two sets of Walschaert valve gear only are used, the piston valve for the inside cylinder being actuated through a simple arrangement of floating levers. The piston valves are of inside admission type; the Caledonian system of steam reversing gear is fitted, also a Caledonian railway pattern of mechanical lubricator, in conjunction with a Wakefield anti-carboniser. Ross " pop " safety valves are employed.

Leading dimensions are as follows:—

Cylinders (3)	18½ in. × 26 in.
Coupled wheels ..	6 ft. 1 in. diam.
Bogie wheels	3 ft. 6 in. diam.
Steam pressure ..	180 lb. per sq. in.
Heating surface—	
203 tubes, 2 in. ..	1,700 sq. ft.
24 tubes, 5 in. ..	500 sq. ft.
Firebox	170 sq. ft.
Superheater ..	270 sq. ft.
Total ..	2,640 sq. ft.
Grate area	28 sq. ft.
Adhesion weight ..	60 tons.
Engine weight in working order	81 tons.
Tender weight in working order	48 tons.
Total length over buffers	63 ft. 8 in.
Tractive force at 85 per cent.	28,000 lb.
Coal capacity of tender	5½ tons.
Water capacity of tender	4,500 gallons.

The Railways Act, 1921.

ROYAL ASSENT was given on August 19, and the railway companies are now busy in connection with the amalgamation procedure entailed thereby, and with the many incidental problems involved. Amalgamation is to be an accomplished fact by July 1, 1923, but meanwhile the railways are " carrying on " with their ordinary business as separate concerns, except that in certain instances they are already working together to some extent, the full complexities of Railway Clearing House work are not being resumed, by arrangement between the parties, and in other ways there is a degree of anticipation of the terms of the Act. There will only be four groups, instead of six as at first intended: (1) Southern; (2) Western; (3) North Western, Midland and West Scottish; and (4) North Eastern, Eastern and East Scottish. Nos. 1 and 2 are relatively of moderate size, though the Western will be the greater in regard to freight traffic owing to

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its inclusion of the Great Western and the Welsh mineral lines. Nos. 3 and 4 are each considerably greater, the palm going to No. 3, which will not only be the "largest joint stock corporation in the world" taking that title from the London and North Western Company, but will probably be the biggest traffic concern in the world operating under a single ownership, though there are many railways abroad having considerably greater mileage. The principal change, apart from the reduction from six to four groups, is that in the Western group the Barry, Cambrian, Cardiff, Rhymney, Taff Vale and Alexandra (Newport & South Wales) systems become constituent companies. The numbers of directors for each group now specified are 28 for the two larger ones, 25 for the Western and 21 for the Southern. Other important features are the provisions for maintaining the Central and National Wages Boards, and the fact that railway charges will not now be covered by the maxima specified in the respective Acts which have hitherto governed them, but will be controlled by the Rates Tribunal.

Birmingham Two-Hour Expresses Again.

COVERED in two or three lines in many of the daily newspapers, the announcement that, commencing October 3, both the Great Western and the London & North Western Railways will again run expresses between London and Birmingham in the even two hours must be regarded as a sign of the times worthy of more than casual mention. Accelerations during the summer have restored many of the train services which appeal chiefly to business men to good approximations to pre-war standards, as, for example, the principal expresses between London and Manchester, Liverpool and Leeds, now booked in four hours; from London to Bristol in two hours five minutes; and between London and Edinburgh and Glasgow in eight and a half hours. The re-introduction of two-hour expresses on the Birmingham route, however, brings this important service right back to pre-war standards, and marks recognition of the fact that if business travel for considerable distances is to provide a maximum of convenience the trains must be scheduled as fast as circumstances will permit. The inclusion of restaurant car accommodation on such trains enables valuable time to be conserved, but half an hour, fifteen or even five minutes more or less occupied on the journey may make all the difference in regard to the amount of time available for doing business. These two-hour expresses had before the war created a large volume of travel to and fro by business men, and this was seriously prejudiced by the extension of the journey time to two and a half hours, and, although this has latterly been reduced to two and a quarter hours, it requires the old time to be re-introduced before this service can show its full value once more. It remains to be seen whether other services of a like character will yet be restored quite to their old levels, but the fact that a beginning has been made with the London-Birmingham service indicates that railway officers recognise the importance of quick transit on routes of commercial importance, and that the needs of the business community, as well as those of the holiday pressure, will materially influence the traffic arrangements of the railway companies now that private enterprise and unrestricted operation are to be the order of the day.

We understand that several other important accelerations are pending, including the return of the Great Western Railway "Cornish Riviera" express to its old schedule of 247 minutes for its non-stop run of 227 miles from Paddington to Plymouth (North Road).

Private Railway Acts of 1921.

PRIVATE Bill promotions by railway companies for the past session have been limited and only five Acts of this character have received the Royal Assent during 1921. Among the new works authorised the most interesting is the North Staffordshire Company's loop line between Etruria and Stoke, the construction of which will greatly improve the traffic facilities in that area. Plans and a description of this line of 1¼ miles, which is estimated to cost £252,837, were given in the RAILWAY MAGAZINE, June, 1921. A large tract of land will be acquired alongside the new line where siding and other accommodation can be provided. The new works programme of the North Eastern Railway Act contemplates a total estimated expenditure of £883,112 on 4 miles of new line, 15¾ miles of widenings and other works. The Act also confirms the purchase, for £150,000, of additional lands required for the working of the King George Dock at Hull. New money powers are given to the North Eastern to the extent of £1,200,000 additional capital with £400,000 borrowing powers, whilst the North Staffordshire may raise £500,000 additional debenture stock, ranking next after the existing stock. The North British Railway Order Confirmation Act sanctions additional debenture stock to the extent of £1,000,000, ranking *pari passu* with the existing 3 per cent. stock. By another Order the North British Company acquires Burntisland Harbour, and the purposes of the London and North Western Railway (Holyhead Harbour Leasing) Act are explained by its title.

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Railway Electrification Report.

THE Electrification Committee appointed by the Ministry of Transport have now published their final report. This embodies the interim report published last year, and which recommended direct current for future electrification schemes, with a special exception in the case of the Brighton Company; 1,500 was to be the standard pressure for new schemes, with 750 volts or multiples of 1,500 volts if approved by the Minister; and three-phase current at 25 or 50 cycles was proposed for generation.

The most important section of the final report is that dealing with the question of current collection. It is pointed out that, while the top contact rail is now generally used for 600–750 volts, the under contact type "has also been largely used, and, in the opinion of the Committee, possesses advantages both as regards interference by snow and ice and also as regards protection of men working on the line." The Committee, however, prefer not to lay down a hard-and-fast rule in favour of under contact rails, more particularly because this type of rail is patented and they wish to leave the door open to "such future improvements as are likely to be developed in either or both types." There can, however, be little doubt that these advantages will in many cases be found to justify the slight extra expense involved in protecting the rail, especially in populous districts. As electrification extends there are bound to be more chances of accident to platelayers and other workmen, and a few such accidents happening near together might lead to such an outcry as would involve the railway companies in much more expense finally than the initial installation of a protected rail would have done.

The dimensions laid down both for the position of collector rails and overhead wires would seem to be based upon a careful study of the available experience and the needs of practical work. Had it been possible to put forth such recommendations 20 years ago they would, of course, have been much more valuable, because at the present day the Committee have felt it necessary, with the usual British respect for compromise and individual liberty, to temper their recommendations with many exceptions. If the report be adopted, the Ministry of Transport, or its successor, will still have plenty of freedom to permit of experiments, but it is undoubtedly useful to have even a general summary of the most suitable conditions for carrying out electrification. Whatever other obstacles may remain in the way of electrification, the railway companies know, thanks to the work of this Committee, the best lines on which to proceed.

Lowestoft and the Great Eastern Railway.

"A WELCOME opportunity for drawing attention to the varied responsibilities developing upon railway companies," writes a correspondent, "occurs in the case of the Great Eastern Railway and Lowestoft Harbour. As visitors to this picturesque East coast resort will remember, the main street is crossed at the harbour, over the river Waveney, by a swing bridge, controlled and maintained by the railway company. Within the last few weeks, in a local journal, a visitor made some rather severe strictures upon the railway authorities for what he considered their inefficiency in operating the bridge, and the tardiness in manipulating the harbour tugs by their employees. In this connection it will not be inappropriate to give a few statistics regarding the second largest fishing port in England. Apart from the Lowestoft regular fishing fleet of between 400 and 500 vessels, ships up to 2,000 tons burden make use of the harbour facilities. During the autumn months the ordinary fishing fleet of Lowestoft is considerably augmented by vessels from other ports, which use Lowestoft for the herring season. It is computed that over 2,000 boats each week pass through the bridge. The extreme width between the locks is only 60 ft., and year in and year out this large traffic passes backwards and forwards without a hitch. Both those in charge of the harbour works and the tug-masters are highly trained employees, and those who have had the opportunity of watching the working of this harbour will agree that a pæan of praise would be a more fitting tribute to those responsible than the unfair and unfounded criticism which it is often their lot to receive."

Locomotive Trials on the North British Railway.

IN order to determine whether considerable operating economies could not be effected in the heavy mineral traffic flowing between the Fife collieries and Aberdeen if bigger engines than the largest 0-6-0 goods engines of the North British Railway could be employed on this service, a series of trials of locomotives lent by other companies have been conducted between Bridge of Earn and Glenfarg, on the Edinburgh-Perth route. The reason for selecting this bank for the tests is that it exceeds in difficulty of negotiation anything to be met with on the Edinburgh and Aberdeen line. At present the maximum load on the Aberdeen route is 27 loaded mineral wagons, or approximately 513 tons, exclusive of brake van. Another 11 wagons per train would effect a very considerable reduction in the number of trains

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TEST TRAIN LEAVING BRIDGE OF EARN, NORTH BRITISH RAILWAY.

N.E.R. 0-8-0 Locomotive No. 903.

necessary to convey this traffic and consequently in the occupation of the line.

For tests last January a Great Western Railway 2-8-0 freight locomotive was loaned by that company. The obstacle which has so far prevented the use of more powerful freight engines on the North British Railway has been the strength of the bridges, and a Great Western engine was selected for the test on account of its even weight distribution, its maximum axle load being 16·7 tons. This engine was successful in hauling a loaded coal train weighing 590 tons 4 cwt. up the 6-mile gradient of 1 in 75 from Bridge of Earn to Glenfarg in 33 min., start to stop. But in a subsequent test with a train weighing 686 tons which took place during falling snow the engine was brought to a stand about half way up the bank, after many efforts had been made to start and get away. There was no lack of steam, but on each of these attempts to get away the train only moved one or two wagon lengths, the sanding apparatus being completely blocked with snow.

On Sunday, August 28, further locomotive tests were made on the Glenfarg bank, this time with a three-cylinder 0-8-0 freight locomotive built by the North Eastern Railway. But for the intervention of the coal strike these tests would have taken place much earlier in the year. The weather conditions were as favourable for the North Eastern engine as they were unfavourable for the Great Western, the former being also the heavier and by virtue of its three cylinders appeared the more powerful. But the remarkable achievement of the N.E.R. engine in hauling a train weighing 755 tons up a 6-mile 53-chain gradient of 1 in 75 in 33 min. start to stop quite discounts any handicap in its favour.

Results Achieved.

The engine used was No. 903, Class "T 3," built at Darlington works in October, 1919, with three simple cylinders and superheater.

In the first test the total weight of the train, including two 20-ton brake vans, was 617 tons 15 cwt., and the time occupied from Bridge of Earn to Glenfarg was 35½ min. In the second the load was 702 tons 19 cwt., and the time occupied 30 min. In the third the load was increased to 754 tons 16 cwt., the time occupied being 33 min The longer time that was occupied with the lightest load on the first test was probably due to the driver taking matters too easily, the engine being run at one and a-half notches from full gear, cutting off at about 53 per cent., and the regulator full open. On the second test the engine was worked in full gear, cutting off at 75 per cent., and the regulator full open until after passing through the first tunnel, when the driver pulled his reversing lever back three-quarters of a notch, the cut-off being then 65 per cent. On the third test the engine was worked in full gear and the regulator full open throughout the trip. A full boiler pressure of 200 lb. was maintained throughout the first and second trips, and on the third trip, when the second injector was put on during the last mile, it only fell to 195 lb. On entering the first tunnel on the last trip the engine slipped once, but the driver quickly corrected this, and no more trouble was experienced with slipping. The engine was manned by driver T. C. Watson and fireman H. Maughan, stationed at West Auckland, North Eastern Railway.

The tests were conducted in the presence of Mr. William Whitelaw, Chairman; the Earl of Elgin and Kincardine, C.M.G.; Mr. A. Bruce Gilroy, and Major W. H. Booth, D.S.O., directors of the North British Railway Company. Officers of the North British Railway present included Major C. H. Stemp, C.B.E., Operating Superintendent, at whose instance the tests were primarily conducted; Mr. W. Chalmers, Chief Mechanical Engineer; Mr. J. P. Grassick, Locomotive Running Superintendent; Mr. H. Grant, Assistant Operating Superintendent;

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Mr. D. McRobbie, Divisional Operating Superintendent; Mr. J. McColl, Assistant Locomotive Running Superintendent. Others present included Mr. Felix J. C. Pole, General Manager, Great Western Railway; Major H. A. Watson, C.B.E., General Superintendent, North Eastern Railway; Mr. A. C. Stamer, C.B.E., Assistant Mechanical Engineer, North Eastern Railway; Mr. J. Weatherburn, Dynamometer Car Inspector, North Eastern Railway; his assistant, Mr. J. W. Stobart; and Mr. J. A. Kay.

High Speed Runs on the Great Western Railway.

"A LITTLE knowledge is a dangerous thing," and the truth of this is strikingly shown by newspaper references which have gone the round suggesting, though admittedly not directly stating, that the Great Western Railway has a scheduled run of 90·8 miles from Badminton to Southall in 87 minutes, average 62·7 m.p.h. What happened is that some one, we believe on the basis of certain remarks recently made by Mr. Allen, got hold of the "passing times" of the 5.0 p.m. up express from Bristol. This train, for many years a two-hour express, is now scheduled in 125 minutes, in itself a meritorious performance, and as the first few miles are complicated by junctions and adverse gradients, the rest of the journey must be made at high speed. There is, however, nothing remarkable in that a stretch of main line, admirably suited for fast running in this instance, should be booked to be covered as regards passing times of certain stations or signal boxes at a speed of 60 m.p.h. or even more, and the only outstanding feature of this particular run is that speed has to be restricted through Reading to take the platform so as to detach a slip coach. Incidentally the slip coach is booked to arrive at Reading at 6.30 p.m., which leaves only 35 minutes for the remaining 36 miles to London. In practice trains such as this habitually cover the 100 miles from Badminton right into Paddington, including reduced speed from Westbourne Park into the terminus, in a less number of minutes, and we have known them to be run in from 93–96 minutes, including the Reading slack. As Southall is a high-speed passing station the figures stated are quite practicable. The newspaper extracts also refer to 17 miles being run in about 13 minutes—we have not the exact figures before us—but any such statement is complicated by the fact that both distance and time are expressed in round figures. Something less than 17 miles run in a fair number of seconds more than 13 minutes would materially alter the situation, and render the performance much less sensational and more in accord with the probable facts.

NORTH EASTERN RAILWAY LOCOMOTIVE No. 903 (THREE CYLINDER 0-8-0) AT BRIDGE OF EARN, NORTH BRITISH RAILWAY.

Historic Locomotives at Chicago.

From July 30 to August 14 Chicago was provided with a "Pageant of Progress,"

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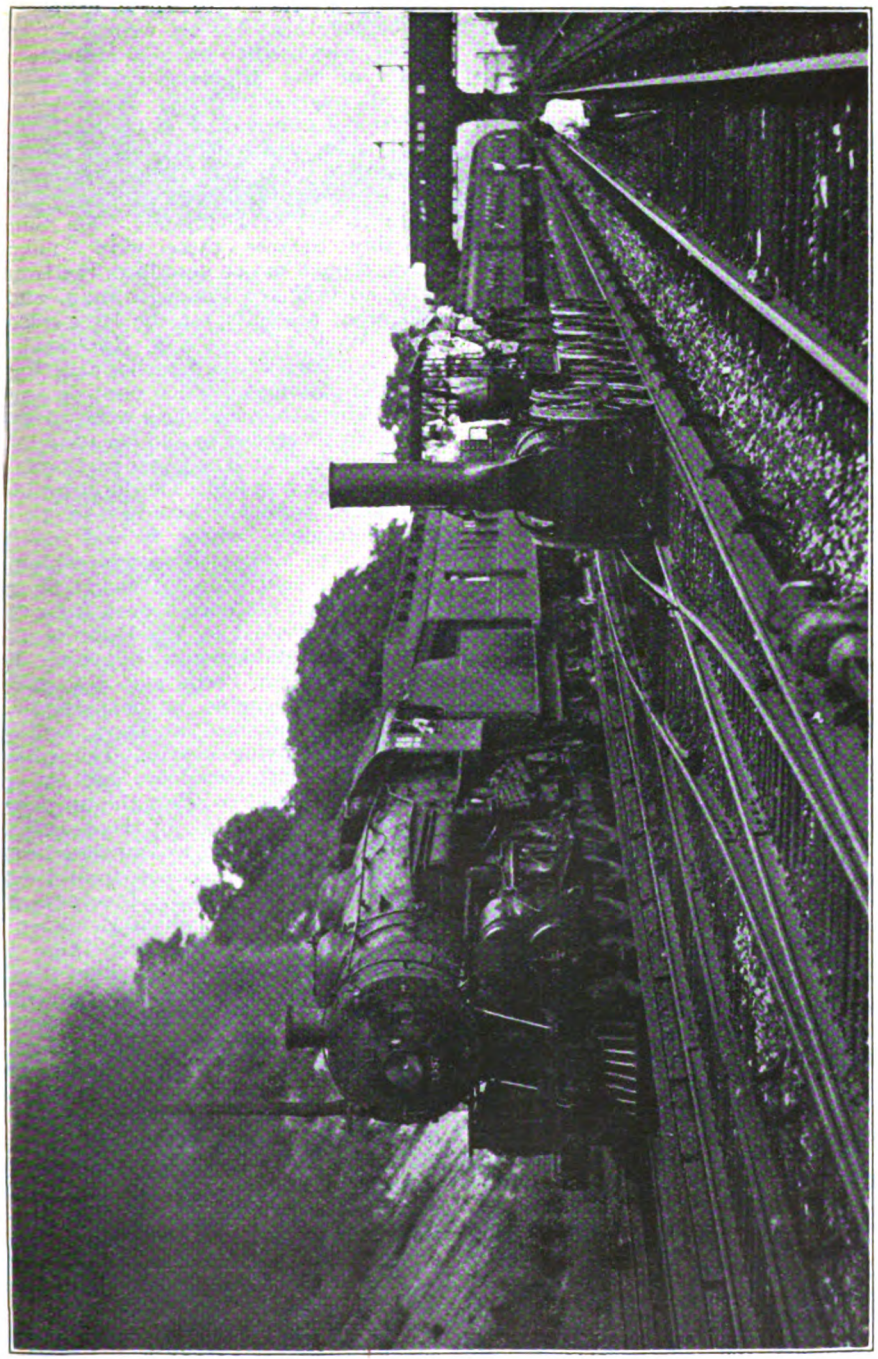

"ANCIENT AND MODERN"—"THE LAKE SHORE LIMITED" 1921, AND THE "DE WITT CLINTON" 1831.

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in which two famous locomotives figured prominently. One was the old *De Witt Clinton*, with its train of stage coach type vehicles, with which the Mohawk and Hudson Railroad, the first section of what has since become the New York Central Railway, was opened in 1831, making its inaugural trip from Albany to Schenectady on August 3 of that year. The old engine and train have for some months past been standing on a pedestal in the hall of the Grand Central Terminal in New York, but were placed on flat cars and taken to Chicago for the pageant referred to. The famous "Empire State Express" flyer No. 999, with that number reinstated for the time being, constituted the second attraction, and was used to haul its primitive "ancestor." No. 999, reports as to whose demise being obviously falsified by its appearance once more in public as a notability, is credited with having, on May 10, 1893, achieved a speed of 112·5 m.p.h. Unfortunately neither the late Mr. Rous-Marten nor Mr. Cecil J. Allen were available, with their stop watches and extensive experience of exact train timing and expert knowledge of the many pitfalls involved; but although this record has never been accepted in this country as beyond criticism, it is certain No. 999 put up a remarkable performance.

On the way from New York to Chicago the two "star turns" were exhibited at Cleveland, as part of that city's 125th anniversary programme then being celebrated. Some 45,000 people inspected the trains there, and next day, in the presence of about 40,000 spectators, an official reception was held at Toledo by the Mayor, and the President of the Chamber of Commerce; 15,000 people at Rochester, 40,000 at Buffalo, 10,000 at Albany and smaller crowds at other places on the route, indicate the special interest taken in this unique train.

At Chicago the *De Witt Clinton* and train were unloaded and placed on the rails, being fired up and run under its own steam alongside the modern "Lake Shore Limited" express to enable cinema records to be taken. Some of the accounts suggest that the two trains "raced," but this is obviously a bit of journalistic exaggeration, and apparently the old engine was only called upon to jog along at its ancient pace for about a mile. A view obtained at the time is reproduced on page 281. As the old train was required for pageant purposes it was supplied with wood fuel, and its water barrels filled as in the days when it ran regularly, while the "passengers," both inside and outside, were dressed in costumes of the period.

Locomotive and Train Working during the latter part of the 19th Century: Highland Railway.

WITH reference to these articles, just concluded, Mr. Ahrons writes:—"An old friend, who used to have an intimate knowledge of the Highland line during the period referred to has sent me some additional information of interest. The up mail train, which left Wick at 12.10 a.m. on week-days, or as the Highland time-tables put it, 'on every lawful day,' was a mixed train as far as Helmsdale. On Sundays, possibly because these were 'unlawful' days, though not so described, the train was only an ordinary passenger train, and this difference accounts for the later departure from Wick at 2.30 a.m. On week-days, the goods portion was detached at Helmsdale, and the passenger portion went on as far as Tain, where the passengers were turned out, and then proceeded in another train labelled 'Tain to Perth.' The goods portion reached Inverness at 1.45 p.m. On the down journey the mixed train left Inverness at 5.20 a.m. for Helmsdale, where it was overtaken by the 9.40 a.m. *ex*-Inverness, which then became a mixed train to Wick. There was a train which ran once a week from Golspie to Thurso, worked by the Duke of Sutherland's private tank engine *Dunrobin*. On the section between Perth and Inverness the leading pilot engine on non-stopping up trains was unhooked at Dava, whilst the train was moving slowly. The pilot ran ahead into the down loop, and the points were then altered to allow the up passenger train to run through. In those days every train was telegraphed to Inverness, and the crossing orders were issued from there, no staff or ticket being used. Inverness station is a dead end, into which the lines from north and south converge. There is an avoiding loop between the lines to Perth and to Wick, and a weekly Strathpeffer express ran through this loop without stopping at Inverness. This loop was also used for transferring the mail van and through coaches from north to south and *vice versâ*. Some trains ran over the loop and backed into Inverness station to the platform from which they departed when continuing the journey. In regard to the working of mixed trains, the passenger coaches were in the old days often placed at the rear. The Board of Trade, with a view to obtaining more brake power, naturally wished them to be at the front, but the working was much more convenient when they were at the back. The latter system was, however, rather trying for the passengers."

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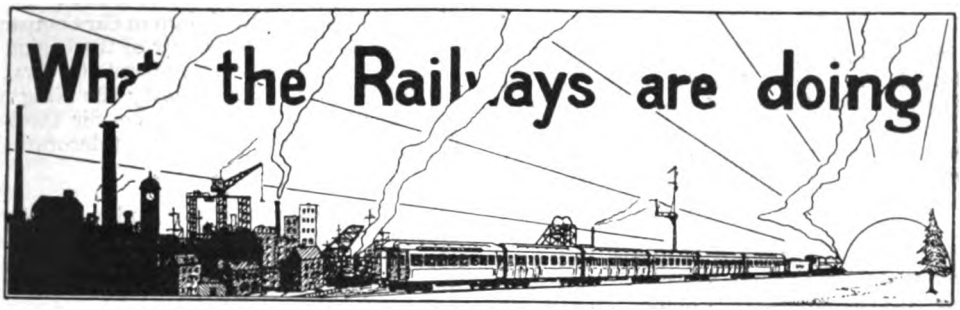

MR. F. V. RUSSELL, C.B.E., Superintendent of Operation, Great Eastern Railway, has temporarily relinquished his duties at Liverpool Street, and has proceeded to the United States and Canada to study operating problems and railway practice. During his absence Lieut.-Colonel H. H. Mauldin has been appointed to supervise the working of the Operating Department on behalf of the General Manager.

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LIEUT.-COLONEL H. H. MAULDIN, who, as announced above, has been appointed Acting Superintendent of Operation of the Great Eastern Railway during the absence in the United States and Canada of Mr. F. V. Russell, C.B.E., entered Great Eastern Railway service as a junior clerk in the Superintendent of the Line's Department, and, after obtaining wide experience in various offices, was attached to the staff of the Superintendent in the special traffic section. In 1915, he enlisted as a sapper in the Royal Engineers (railway troops), served for a considerable period in the Railway Operating Division in forward areas in France, and obtained a Commission. After the Armistice he was transferred to the R.E. Stores Directorate as Traffic Officer, and was subsequently appointed Assistant Director with the rank of Lieut.-Colonel. On his return to the Great Eastern Railway he was attached to the General Manager's Department for duties more particularly in regard to traffic questions; hence his selection to represent Mr. Russell during the latter's absence.

LT.-COL. H. H. MAULDIN,

Acting Superintendent of Operation, Great Eastern Railway.

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MR. W. J. ENGLAND, Assistant to the Western District Superintendent, London and South Western Railway, has, as announced last month, been temporarily appointed Traffic Superintendent, Somerset and Dorset Joint Railway, rendered vacant by the resignation of Lieut.-Col. A. S. Redman, who has returned to the War Office. Mr. England joined the company's service in 1896 as junior clerk at Chard Junction. Afterwards he was transferred to Bentley, thence to Farnham, and subsequently to Farnborough, at which station he gained considerable experience in connection with the movement of troops for the Boer War. Later he was moved to the office of the Superintendent of the Line, and in 1912, when the traffic districts were reorganised and assistants appointed, Mr. England was promoted to be Assistant to the Western District Superintendent.

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MR. BEN CARPENTER has been appointed Personal Assistant to the General Manager of the Barry Docks and Railway Company. He commenced his career with the company at the docks in the year 1901, and after serving under the Shipping Superintendent for some years was transferred to the General Manager's Department. His abilities were early recognised, and from

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time to time he has filled important positions.

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MR. HUGH I. MITCHELL has been appointed Assistant Superintendent of the Glasgow and South Western Railway, in succession to Mr. William Armstrong, whose portrait was published last month on his appointment as Superintendent of the Line.

* * *

MR. A. E. HAMMETT, A.M.Inst.T., has been promoted Chief Cartage Assistant to the Outdoor Goods Manager, London and South Western Railway. Previous to joining this company he was in the employ of Messrs. Chaplin & Co., cartage agents. His service with the South Western Railway commenced in 1905 at the Borough Depôt, where he remained until 1913, having gained useful experience in all branches with goods, parcels and passenger train traffics. In 1913 he was transferred to the office of the London Goods Superintendent, being entrusted with special inquiry work and reorganising the company's rope stock during 1914–5, to meet the demands of war traffic. In 1916 he occupied the position of Personal Clerk to the London Goods Superintendent, and in 1917 was made Outdoor District representative. His abilities were further recognised in July, 1919, when he was appointed one of the Outdoor General Assistants.

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MR. W. H. DICKSON, Secretary and Manager of the Jersey Railways and Tramways, retired at the end of August after 28½ years' service.

* * *

SIR JOHN ROSS, Lord Chancellor of Ireland, has nominated Mr. W. Carrigan as Chairman of the Irish Railway Arbitration Committee.

* * *

MR. F. G. WAINWRIGHT has succeeded Mr. Bolter as Divisional Superintendent of the Great Western Railway at Cardiff. He entered Great Western service at Ross in 1888, and occupied various positions in that district until 1899, when he was appointed relief clerk at Cardiff. In 1906 he was transferred to the office of the Superintendent of the Line, and was engaged chiefly on outdoor duties in connection with the working of freight trains. In 1910 he was promoted to the position of Chief Clerk to the Divisional Superintendent at Gloucester, and the following year was removed to Cardiff in a similar capacity. In 1914 he was made Assistant to the Divisional Superintendent at Cardiff.

THE President of the French Republic has conferred upon Sir Davison Dalziel, Bart,. M.P., Chairman of the Pullman Car Company, Limited, the Cross of Officer of the Legion of Honour for services rendered to France during the war. His Majesty the King has been graciously pleased to give Sir Davison Dalziel permission to wear this decoration.

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MR. W. W. COOKE, of the London and North Western Locomotive Department, has been appointed a Sub-Inspecting Officer of Railways by the Minister of Transport.

* * *

MR. G. L. COLVIN, C.B., C.M.G., D.S.O., appointed Agent to the East Indian Railway, has, since 1919, held the position of Director of Development in the Ministry of Transport. Mr. George Lethbridge Colvin was born in 1878, and is the eldest son of the late Clement Sneyd Colvin, C.S.I., at one time Secretary of the Public Works Department of the India Office. In 1898 he went to India as a probationary Assistant Traffic Superintendent on the railway where he now takes the chief executive position. He served in various positions both at headquarters and on the line until 1906, when he was promoted to be District Superintendent, subsequently becoming in turn Divisional Superintendent, Divisional Traffic Manager, Chief Superintendent and Traffic Manager, posts which gave him a wide experience in the commercial and operating sides of railway working in India. On the outbreak of the Great War he came to England and was given a commission as captain in the Transportation Corps. He served as a Railway Traffic Officer in France until May, 1915, being then appointed Deputy Assistant Director in charge of transportation at Boulogne Docks. In May, 1916, he was appointed Assistant Director of Railway Transport at Headquarters, Lines of Communication, taking the rank of major, until promoted to be lieutenant-colonel in October, 1916. In May 1917, he was placed on special duty to organise transportation arrangements on the then newly opened Mediterranean Line of Communication, and was promoted to be Assistant-Director General of Transportation, with the rank of colonel. At the end of 1917, when a British army was sent to Italy, he accompanied General Gray, Director-General of Transportation to Italy, as his second in command, and three months later succeeded him with the rank of brigadier-general. He remained in Italy until May, 1919. After he returned to England, on the formation of the Ministry of Transport, he was appointed Director of Development, the position he is now resigning to return to

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India as agent of the railway upon which he obtained so much of his experience. For services rendered during the war period he received the distinctions of C.B., C.M.G., and D.S.O., and was five times mentioned in despatches. Last spring Mr. Colvin represented the Ministry of Transport at the Barcelona Conference on Communications and Transit.

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MR. GEORGE SURREY WARNER, the son of the London and South Western Railway Carriage and Wagon Superintendent, has been appointed Assistant Carriage and Wagon Superintendent of the Great Indian Peninsular Railway, Bombay. On Friday, July 29, at the Eastleigh Carriage Works, he was presented with a wristlet watch and gold-mounted fountain pen by the staff and foremen. Mr. A. A. Shepherd, Chief Assistant, made the presentation on behalf of the subscribers.

* * *

MR. J. S. WILSON, O.B.E., Assistant Audit Accountant of the South Eastern and Chatham Railway Companies' Managing Committee, has consented, with the sanction of his General Manager, to act as one of the Advisers to the Treasury in their negotiations with the French Government for the settlement of various outstanding transportation questions. The experts acting on behalf of the French Government in connection with these matters are :—Monsieur Nadal, Ingenieur en Chef, attaché à la Direction des Chemin de fer de L'Etat ; Monsieur Sartiaux, Chef des Services Administratifs de la Cie des Chemins de fer du Nord ; Monsieur Gruzon, Chef de la Comptabilité Generale et des Finances de la Compagnie de L'Est.

* * *

MR. GEORGE POTTER NEELE, of Watford, who for 30 years was Superintendent of the Line, London and North Western Railway, and died aged 95, left property of the value of £17,944. He made the following bequests : The gold pencil case given him by the Prince of Wales, and a large silver tray by the Queen, to his son Francis Joseph ; the chiming clock presented by Her Majesty, and a shirt pin by the Empress of Brazil, to his son Ernest Albert ; stud given by the Empress of Austria, a copy engraving of the Royal Family (1887 Jubilee) presented by the Queen, and a large bowl by members of the Royal Household, to his son Charles William. Mr. Neele left the interleaved copy of his published volume of "Railway Reminiscences" to the London and North Western Railway directors, "trusting they may find interest therein."

THE second dinner of the Institute of Transport, originally fixed for April 26 last, will be held in the Victoria Hall, Hotel Cecil, London, W.C., on Monday, October 10, at 7.30 p.m., prior to which the President, Lord Ashfield of Southwell, will hold a reception of members and guests. A representative and distinguished company is anticipated. Applications for tickets should be addressed not later than October 4 to the Hon. Secretary, Mr. H. E. Blain, C.B.E., 2 and 3, The Sanctuary, London, S.W. 1.

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MR. S. WILLIAMSON, General Manager of the Cambrian Railways, recently entertained the Afonwen prize ambulance team to dinner at Pwllheli, and, on behalf of the Chairman (Major David Davies, M.P.), presented to Mr. D. C. Owen, stationmaster, the Cambrian Shield, won by the Afonwen station team this year. Referring to the grouping of the Cambrian line with the Great Western system, Mr. Williamson said he had already told the general manager of the Great Western Company that the unrivalled Cambrian coast was a veritable gold mine for a big company who could double the line.

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A FAREWELL luncheon and presentation were given on August 26, at the Great Eastern Railway Hotel to Mr. Fred. C. Salter, who has been European Traffic Manager of the Grand Trunk Railway since 1908. There were present at the gathering Sir Alfred Smithers, former Chairman of the Grand Trunk Railway ; Mr. William Phillips, European Manager of the Canadian National Railways ; Mr. P. A. Clews, of the Grand Trunk Railway ; as well as members of the London, Liverpool and Glasgow staffs of the Grand Trunk Railway, Canadian National Railways and the Canadian Express Company. A handsome canteen of silver cutlery, suitably engraved, was presented to Mr. Salter by Sir Alfred Smithers on behalf of the railway staff.

* * *

PREMIUMS awarded by the North British Railway for the best kept stations on their system have been allocated as follows : First class (£4), 20 awards as follows : Auchtermuchty, Barrasford, Bents, Blairadam, Bothwell, Commonhead, Corstorphine, Culross, Gartness, Jamestown, Joppa, Kilbagie, Kirkliston, Manuel, Morningside Road, Newcastleton, Newport East, Rosslyn Castle, Shankend, Slamannan. In addition, there have been 40 second-class awards of £3, 60 third-class awards of £2, and 80 third-class awards of £1.

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In connection with the Underground Railways Station Competition, in which awards are made to the smartest stations as regards civility of staff, efficiency in station working and cleanliness of station platforms and booking halls, the winning stations of the last half-year on each of the six Underground lines are as follows:—District Railway, Earl's Court; Hampstead Railway, Kentish Town group; Piccadilly Railway, Dover Street; Central London Railway, Liverpool Street; Bakerloo Railway, Waterloo; City and South London Railway, Moorgate Street. In due course the challenge shields which form the principal award in the competition will be mounted in the respective booking halls.

* * *

It was a source of extreme gratification to all interested in the welfare of the London and South Western Railway Orphanage when His Royal Highness the Duke of York kindly consented to honour with his presence a matinée concert held at the Kingston Empire recently, in aid of the Orphanage funds. His Royal Highness was received at the entrance to the theatre by the Mayor of Kingston (Dr. W. E. St. Lawrence Finny) and Sir Charles J. Owens, C.B., a director of the London and South Western Railway and President of the Orphanage, all of whom wore York roses as a compliment to the Duke of York. The following members of the Orphanage Committee were presented to him:—Mr. G. T. Hedge, hon. secretary; Mr. A. E. Smith, secretary and superintendent; Mr. S. E. Marsh, hon. line superintendent; Mr. T. Orme, chairman of the Southampton district committee; Mr. G. W. Betteridge, chairman of the London district committee; Mr. H. O'Neill, secretary of the London district committee; Mr. W. Gude, one of the original founders of the Orphanage; Mr. W. Gulliver, chairman of the Strawberry Hill district committee; Mr. T. J. Pile, hon. secretary of the Strawberry Hill committee; and Mr. W. Stanley Ketchell, manager, and one of the musical directors of the concert. During an interval, Mr. Orme gave some interesting details concerning the work of the London and South Western Railway Orphanage, the doors of which, he said, were always open to the fatherless children of men who at the time of their death were in the employ of the London and South Western Railway Company. To maintain the home an income of £6,000 per annum was required, and of this amount over £3,000 was subscribed by the railwaymen themselves.

HIGHLAND RAILWAY WAR MEMORIAL.

* * *

The memory of the men of the Highland Railway who made the supreme sacrifice in the Great War has been fittingly honoured by the erection of a handsome bronze tablet in the Station Square, Inverness. With simple but impressive ceremony this was unveiled on Saturday, August 6, by General Lord Horne, G.C.B., K.C.M.G., A.D.C., Baron of Stirkoke, in the presence of a large gathering, which included Mr. W. H. Cox, Chairman of the Highland Railway Company, who presided; Mr. Albert E. Pullar, Deputy Chairman; Lord Lovat; Colonel James E. B. Baillie; Sir Hector Munro, Bart.;

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Mr. J. D. Fletcher; Major A. D. Mackinnon, C.M.G.; and Mr. Grigor Dixon, Glenalmond. The officers of the Company present included Mr. Robert Park, General Manager; Mr. T. McEwen, Traffic Manager; Mr. C. Cumming, Locomotive Superintendent; Mr. A. Newlands, Engineer-in-Chief; Mr. George T. Cornet, Secretary; Mr. J. Sutherland, Factor; Mr. C. Kennedy, Stores Superintendent; Mr. H. H. Ward, Hotels Manager; Mr. D. Butter, Cashier; and Mr. Masson, Chief Clerk. Relatives of the fallen occupied seats in the front portion of the enclosure. The Memorial, which was draped with the Union Jack, was then unveiled by Lord Horne, who said, "I unveil this tablet to the glory of God and in memory of the men of the Highland Railway who gave their lives for their King, for their country, and for the cause in the Great War." The Rev. Donald Macleod having offered a dedication prayer, Mr. Macphail, Station Superintendent, proposed a vote of thanks to Lord Horne, and his lordship in acknowledging the compliment, observed that the Highland Railway Company did great work during the war. Out of 3,000 employees the company had sent 756 to the war. Of these 756, 25 per cent. of the employees, 87 names were written on the tablet. In addition, the Highland Railway Company kept the line going, carrying the enormous amount of traffic of all sorts required by the Fleet up at Scapa Flow. Wreaths were placed at the base of the tablet on behalf of the directors of the company, the head officials, the Station Hotel staff, and relatives. The Memorial is affixed to the wall of the head office buildings in the Station Square and immediately adjoining the main entrance. The tablet is of solid cast bronze, with delicately modelled and chased enrichments, with the lettering raised and polished bright in the face. At the top of the tablet is a raised shield with the Highland Railway Company's Coat of Arms surrounded by a scroll containing the motto: "Pro Deo Pro Patria," interlaced with a spray of laurel and cycas. The Memorial, which is of chaste design, measures 7 ft. by 4 ft. It was executed by the Bromsgrove Guild, Bromsgrove, Worcestershire.

* * *

On Saturday, August 27, the second annual championship meeting of the Great Eastern Railway Amateur Athletic Association was held on the new sports ground known as Thornton Field, Warton Road, Stratford, this being the first occasion on which the new ground has been used for other than a few private events. On the conclusion of the programme, the prizes were presented from the grand stand by Lady Thornton. In proposing a vote of thanks to her, Colonel Galloway pointed out that this was an auspicious occasion in that it was not only the second annual championship meeting, but the first to be held on the new ground. Colonel Galloway remarked that while the future of railways was as yet uncertain, shareholders and railway officers alike realised the importance of a contented staff working harmoniously together. Whoever controlled the railways would come to grief unless they could rely upon the good feelings of their employees and adopted a policy of encouragement. Mr. A. J. Hill, C.B.E., Chief Mechanical Engineer, seconded the vote of thanks in a short speech. The vote of thanks was carried by acclamation, and on behalf of Lady Thornton Sir Henry replied. It was a great pleasure to his wife and to himself, said Sir Henry, to come among them, for he did not like to work with people if he could not play with them also, and this represented one of the occasions for the latter. Following up the line of thought suggested by Colonel Galloway, he referred to the necessity for team work. Running a railway was fundamentally very much the same as a tug-of-war. All must pull together, and he had no fear that on the Great Eastern Railway they would be lacking in that respect. He thanked Colonel Galloway and Mr. Hill for their kind remarks, and specially congratulated Mr. Rudland and Mr. Hansell, together with those who had worked with them, in regard to the organisation and preparations for the meeting. Mr. Miller, Chief Civil Engineer, as Chairman of the Association, added a few remarks.

* * *

On Saturday, September 3, in the lakes adjoining the power station of the London and North Western Railway at Stonebridge Park, the Stonebridge Park Recreation Club (Swimming Section) held its second annual swimming gala. In addition to the usual events great interest was aroused by the fact that the London Railways Athletic Association were invited to swim their annual quarter-mile championship, supplemented by a team race. There were 10 starters for the quarter-mile, which proved to be an exciting race, and was eventually won by the holder, A. C. Eagle, South Eastern and Chatham Railway; A. D. Johnson, London and South Western Railway, second; H. Crompton, South Eastern and Chatham Railway, third; and C. F. Duke, London and North Western Railway, fourth. In the London Railways Athletic Association's team race (handicap), the winning teams were:—First, London and North Western Railway A Team; second,

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Great Eastern Railway A Team; third, London and North Western Railway B Team. Lieut.-Colonel F. A. C. Leigh, Chief Electrical Engineer, London and North Western Railway, distributed the prizes. Arrangements were carried out by Mr. H. R. Richardson, Hon. Swimming Secretary, Stonebridge Park Club, and Mr. H. Wild, Hon. Secretary of the London Railways Athletic Association (Swimming Section), Audit Office, Euston.

* * *

THE Metropolitan Railway Cricket Club defeated the Great Eastern Railway Club in the final cricket match for the London Railway Athletic Association Cricket Shield by 171 to 28 runs, thus securing the much-coveted trophy for the first time. The match was played on the grounds of the London and North Western Railway Athletic Club at Wembley, where a large number of cricket enthusiasts gathered together to see the final contest for which eight clubs had fought during the present season. In the absence of the President of the Association, Sir Henry Thornton, K.B.E., the shield was handed over to Mr. E. Holland, captain of the winning team, by Mr. D. H. F. Meacock, the Chairman of the Association. Mr. Meacock welcomed the visitors to the ground and outlined the history of the Cricket Shield, it having been provided a quarter of a century ago by cricket enthusiasts of various railways to promote inter-railway competitions.

* * *

THE Irish Railways (Settlement of Claims) Act, 1921, which received Royal Assent on August 19, provides for the payment by the Government of a lump sum of £3,000,000, as an agreed composition of the claims of Irish railway companies for compensation (exclusive of the guarantee of net receipts during the period of control), which might otherwise have been made under the railway agreements in respect of the possession of the railways by the Government. The Act provides for the distribution of the money amongst the several companies entitled, in accordance with schemes agreed between the companies, or in default of agreement, in such manner as may be settled by a tribunal constituted for the purpose.

* * *

A SMALL committee has been appointed by the Ministry of Transport to investigate the potentialities of light signals, to examine them under trial and recommend for trial or investigation any devices which they may think desirable and to form conclusions with regard to economies; and to report generally on the lines above laid down. The committee consists of Major C. H. W. Edmonds, of the Mechanical Engineers' Department of the Ministry (Chairman); Mr. W. J. Thorrowgood (London and South Western Railway), representing the railway companies; Captain B. H. Peter, of the Westinghouse Brake and Saxby Signal Company; Mr. J. C. Allen, representing the National Union of Railwaymen; Mr. H. J. Oxlade, representing the Associated Society of Locomotive Engineers and Firemen; with Mr. P. Tait (of the Ministry) as Secretary.

* * *

THE Brighton Railway Company announce the introduction of second class Pullman Cars in the Continental Boat Trains which leave Victoria daily at 10.0 a.m. and 8.20 p.m. The Continental Boat Train is the only Brighton Company's train which conveys second class passengers as all second class carriages in the ordinary trains were abolished some years ago, since when only first and third class accommodation has been provided. Since the abolition of the second class carriages, however, third class Pullman Cars have been gradually introduced in the principal services between London and the South Coast, and we understand that in view of their popularity an important development of the third class Pullman Cars will shortly take place in the London and Brighton services.

* * *

MINISTRY of Transport statistics for June show the effects of the coal stoppage on the traffic conveyed during that period. The number of passenger journeys (excluding season-ticket holders) was 80,071,632, or 27·22 per cent. less than in March, but the passenger train-miles were reduced by 41·89 per cent. As regards freight traffic: the total tonnage conveyed showed a decline of 21½ million tons, or 74 per cent., compared with June, 1920; and the ton-miles worked indicate the considerable decrease of 69 per cent. Freight train mileage shows a reduction of 59·4 per cent. compared with June, 1920, but the decrease in coal and coke and other heavy traffics again seriously affected the operating results. The average wagon and train loads were 3·64 tons and 101·43 tons respectively, as compared with 5·43 tons and 133·79 tons in June, 1920, and the net ton-miles worked per engine-hour were 355½ as against 441½ in the corresponding month of last year. New rolling-stock completed and put into traffic during the month was 52 steam locomotives, 107 passenger carriages, and 1,780 wagons.

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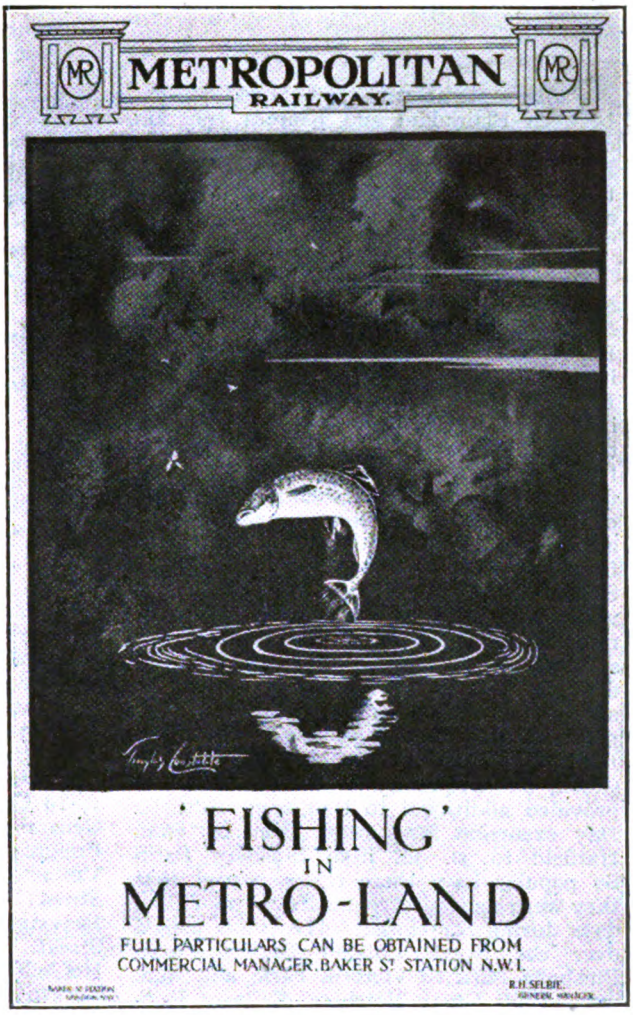
At King's Cross Station, the Great Northern Railway terminus in London, a new and better system of platform nomenclature has now been adopted. The lines are now numbered from 1 to 15 without regard to whether they are used for arrival or departure or for either purpose. Previously there were arrival and departure platforms bearing the same numbers, while in the local station letters were used. The lines are now numbered in order from No. 1 arrival, the main departure platform being No. 10, that used by trains from the Metropolitan Railway is No. 14, and the platform behind, adjacent to the milk dock, is No. 15. Directing signs are liberally provided, while the platform numbers are shown in large numerals wherever required. These numerals are also painted on the outer side of the wind screen at the north end of the main station, so as to be clearly visible from incoming trains and to the shunting and traffic working staff. The bridge carrying Battle Bridge Road across the whole of the station area, and over the outer ends of the longer platforms, has been pulled down as part of a general scheme of improvement and alteration, and there is now a clear and unobstructed view over all the lines and connections between the platforms and the mouths of the Gas Works tunnels.

* * *

Discontinued during the coal strike and since the termination thereof operated only on a partial basis, on Monday, April 29, the Great Eastern Railway resumed their well-known intensive suburban services on the Enfield, Palace Gates and Chingford routes from Liverpool Street. A few modifications are included in view of suggestions made by regular travellers, but on the whole these services are reinstated in the intensive form which has placed them among the most remarkable operated anywhere.

* * *

Many delightful streams in the delectable region known as "Metro-Land" make a powerful appeal to the devotees of Izaak Walton—a fact which has not been lost sight of by the Publicity Department of the Metropolitan Railway, who have issued a very striking poster in that connection. The poster, which measures 25 in. by 40 in., is a fine piece of colour work, and is bound to attract attention wherever it is exhibited.



A TOPICAL METROPOLITAN RAILWAY POSTER.

* * *

The Great Western Railway recently re-introduced the conveyance of motor cars by passenger train through the Severn Tunnel between Severn Tunnel Junction and Pilning and Patchway Stations. The company supplies, without additional charge to the owners of cars which have passed through the tunnel, an amount of petrol equal to that taken from the car before entraining, on presentation of a voucher from the forwarding station. By the use of the tunnel, motorists to and from South

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Wales avoid the long road detour via Gloucester.

* * *

FROM September 1, Loch Leven Station, between Blairadam and Kinross Junction, on the Edinburgh-Perth route of the North British Railway, was closed for passenger traffic, the train service being adjusted accordingly.

* * *

DURING the past summer through day excursion trains have been operated from Great Northern Railway stations in the London suburban area to Southend-on-Sea, in conjunction with the Great Eastern Railway. These constitute a distinct innovation, and since the first trip on July 31, it has been necessary to provide separate through trains on Sundays, one from Hatfield at 9.40 a.m. (from Hitchin at 8.50 a.m. on August 21), the other from Gordon Hill at 9.38 a.m., the respective trains returning from the Great Eastern Railway station at Southend at 8.50 and 8.30 p.m. Connections were given at Wood Green or Finsbury Park from other Great Northern Railway suburban stations. These trips were also run on Thursdays, the through train leaving Hatfield at 9.40 a.m., and returning from Southend at 8.20 p.m. As advertised, passengers from the Enfield branch had to change at Wood Green, but frequently a through train was provided additional to that from Hatfield. Day excursion fares range from 6s. from Hatfield to 3s. 9d. from Finsbury Park. So popular have these trains proved that they were continued on Sundays and Thursdays during September. The trains passed over the North London Railway from Finsbury Park to Victoria Park, and were worked by Great Northern Railway locomotives throughout, Great Eastern Railway pilotmen and guards being provided from Victoria Park.

* * *

THE Lancashire and Yorkshire, and London and North Western Railways inaugurated on Friday, September 2, with corresponding trips on Fridays, September 16 and 23, day excursions from various stations in Lancashire to London. The outward train left Victoria Station, Manchester, at midnight on Friday, with connecting trains from a large number of Lancashire and Yorkshire Railway stations. The return train left Euston at 11.50 p.m. on the Saturday evening, thus giving a long day in London. These arrangements were adopted in view of the Confectioners' and Bakers' the Shipping, Engineering and Machinery, and the Grocers' and Provision Dealers' Exhibitions, the football match, Manchester City *v.* Arsenal, on September 17, and the National Band Contest at the Crystal Palace on September 24. A somewhat unusual feature of the announcement is the statement that the southbound journey is made via Stoke returning via Crewe. As usual with day excursions, though this one was of a type common before the war, but now, we believe, introduced afresh for the first time, tickets were issued at single fare for the return journey.

* * *

HITHERTO the return boat train in connection with the Great Eastern Railway Hook of Holland and Antwerp steamers has been booked to leave Harwich (Parkeston Quay) at 8.55 a.m., and has been due to reach London at 10.30 a.m. This service has now been expedited, the boat train leaving Parkeston Quay at 7.50 a.m., and reaching Liverpool Street at 9.30 a.m.—a gain of one hour.

* * *

IN connection with the consolidation of the European Traffic Offices of the Canadian National and Grand Trunk Railways, the following appointments, under this consolidation, are effective from September 1: London—Freight Department: Mr. George E. Cowie, General Freight Agent, in charge of United Kingdom Freight Traffic Office, 17-19 Cockspur Street; Mr. P. A. Clews, General Freight Agent, in charge of European Freight Traffic (with the exception of the United Kingdom) Office, 17–19, Cockspur Street; Mr. J. Deed, City Agent, Freight and Passenger Departments, 44-46, Leadenhall Street. Passenger Department: Mr. J. P. McClelland, District Passenger Agent, 17-19, Cockspur Street. Publicity Department: Mr. F. J. G. Smith, Publicity Agent, 17-19, Cockspur Street. Liverpool—Mr. H. V. Caldwell, District Passenger Agent, Cunard Buildings; Mr. E. L. Roper, District Freight Agent, Cunard Building. Glasgow—Mr. J. M. Walker, District Agent, 75, Union Street. Manchester—Mr. J. R. McEwan, District Agent.

* * *

THE Great Eastern Railway Harwich-Zeebrugge service, which commenced on July 2, is growing in popularity, each week more passengers making use of this route as a comfortable and time-saving means of reaching Ostend, Brussels, and all parts of Belgium. The boat train leaves Liverpool Street at 8.40 p.m. on Mondays, Wednesdays and Saturdays, arriving at Zeebrugge in the early morning, where a train is waiting for Brussels (arriving 8.42 a.m.) and other parts of Belgium.

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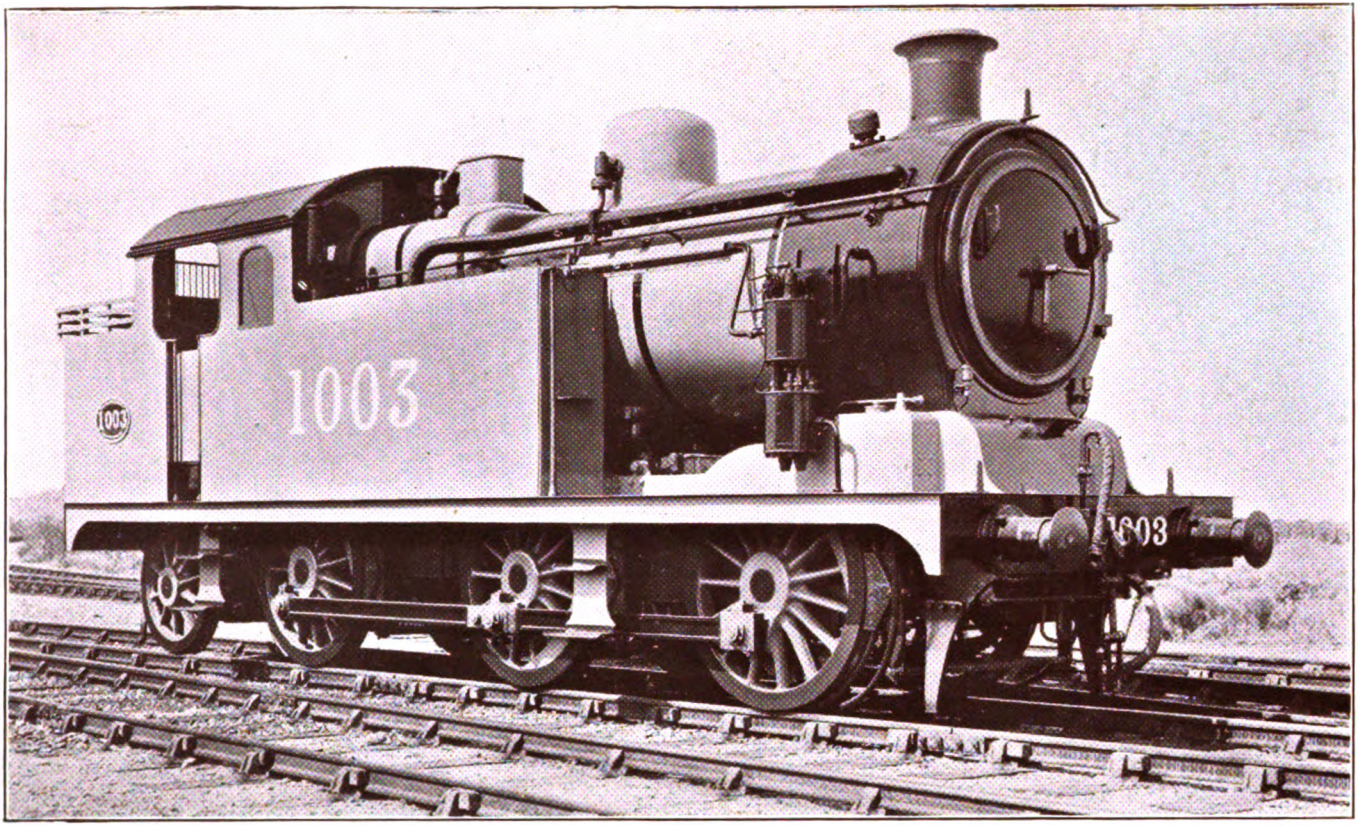

THE RAILWAY MAGAZINE.

0-6-2 CONDENSING TANK ENGINE No. 1003, GREAT EASTERN RAILWAY.

Mr. A. J. HILL, C.B.E., Chief Mechanical Engineer.

Cylinders, 18 in. by 24 in. Coupled Wheels, 4 ft. 10 in. diam. Trailing radial wheels, 3 ft. 9 in. diam.
Heating Surface—Tubes, 1,281·2 sq. ft.; Firebox, 113 sq. ft.; Total, 1,394·2 sq. ft. Grate Area, 17·7 sq. ft.
Steam Pressure, 180 lbs. per sq. in. Weight in working order, 60 tons 13 cwt. 2 qrs.

(Generally similar to No. 1000, this engine has the Westinghouse brake differently placed, and includes several minor changes. It bears the large numerals now being adopted for control record purposes.

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0-4-4 PASSENGER TANK ENGINE No. 15.

"Loop Line" Services on the North Staffordshire Railway.

By "WAGONEER."

THE collection of towns and districts in that part of North Staffordshire known as the "Potteries," and famous, or infamous, to those people who have never been there for its alleged smoke and dirtiness, presents several interesting features as looked at from the standpoint of the railway enthusiast, not the least of which is the excellent timetable maintained by the North Staffordshire Railway's "Loop Line" service of trains.

Although the actual loop line is only about 7 miles in length, the service that now comes under the heading of "Loop Line" in the timetables, taking Stoke-on-Trent as the centre (being, perhaps the best known station to readers outside the district) extends to Congleton on the Macclesfield and Manchester main line for a distance of 13¾ miles, and in the opposite direction to Uttoxeter (main line to Derby and Burton) for 16¾ miles. There is also a single line branch from Cresswell to Cheadle, 3⅞ miles in length.

One of the interesting features of the line under consideration is that of the 30½ miles covered by these particular trains, excluding the aforementioned branch, less than nine miles is over gradient easier than 1 in 275. A somewhat surprising fact, having in mind the severity of the inclines, is that practically the whole of the loop line trains are worked (and very ably too) by four-coupled tank engines with the comparatively large wheel diameter of 5 ft. 6 in. Of these, there are now two distinct types, with one or two minor variations to each, the older, and unfortunately (from a historic point of view) gradually disappearing kind, known officially as the A and B classes, being of the once almost universal 2-4-0 or 2-4-2 wheel arrangement, both with 4 ft. 2 in. diam. boilers. and 17 in. by 24 in. cylinders. The North Staffordshire Railway possess 19 of the six-wheeled engines and six of the 8-wheeled, only two of the former having coupled wheels of less than 5 ft. 6 in. diam. the exceptions being one each of 5 ft. and

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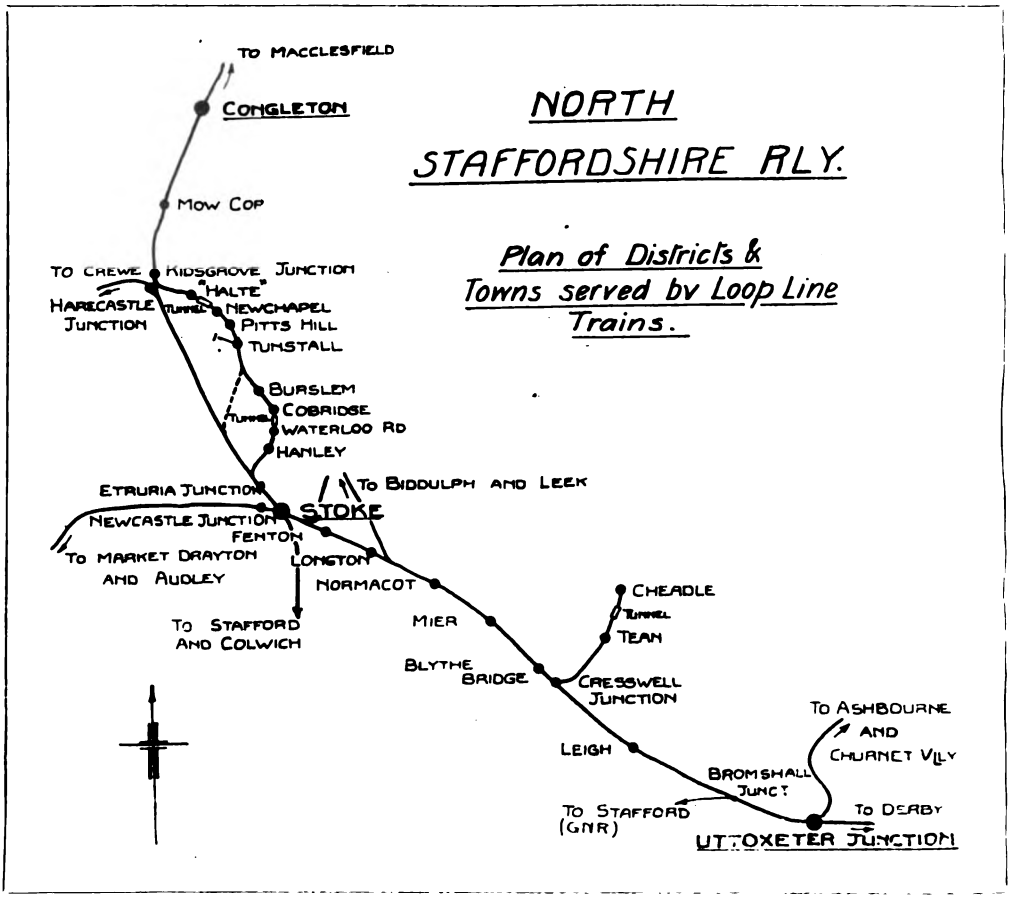
4 ft. 6 in. diam., but neither of these is now, or likely to be in the future, employed on the loop line service. Of the 2-4-2 locomotives, three have coupled wheels, 5 ft. 6 in. diam. and three of 5 ft. The other and more modern type, known as the M and New M classes, is the 0-4-4 with 4ft. 7in. diam. boilers, and 18½ in. by 26 in. cylinders. There are at present nine of these engines with 5 ft. 6 in. coupled wheel

thened" (*vide* weekly notices) by the addition of one extra third-class coach. It may be mentioned in passing that the word "strengthened" expresses the Traffic Department's point of view only, as it has not yet been possible to convince the enginemen that their train is made stronger by adding more vehicles.

There are some 23 stations, including two on the Cheadle branch, served by the



diam., three at least of which are stationed elsewhere than at Stoke, and only very rarely appear on the loop line trains. The chief difference between the original and New M classes is that the latter have "pop" safety valves, steam sanding and a little larger coal and water space.

The trains generally average about 80 tons behind the engine in normal times, but on special occasions such as football matches or holidays they are "strengthened" (*vide* weekly notices) by the addition of one extra third-class coach. It may be mentioned in passing that the word "strengthened" expresses the Traffic Department's point of view only, as it has not yet been possible to convince the enginemen that their train is made stronger by adding more vehicles.

There are some 23 stations, including two on the Cheadle branch, served by the loop line trains and every train stops at every station, but all trains do not run right through to Congleton in the one direction or Uttoxeter in the other. From the down platform at Stoke there leave on an ordinary weekday (on Saturdays the service is slightly augmented) about 48 loop line trains the first being at 5.45 a.m. and the last at 10.57 p.m., which averages a train to just over 23 minutes, though they are actually much more

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frequent than this during the rush hours. Of these trains, 27 only go as far as Tunstall, five miles and six stations from Stoke, whilst 11 terminate at Newchapel, 1¾ miles and two stations further on, four at Kidsgrove making an addition of 1¾ miles, one halt and one station, and the remaining five continue on to Congleton, being another 5½ miles and two stations, with a more or less corresponding service in the opposite direction.

To be exact 49 trains travel via the loop line from the Congleton side into Stoke but three or four of these are through stopping trains from Manchester or Macclesfield, and either terminate at Stoke or run on to Stafford. There are, of course, numerous main line trains between Stoke, Etruria, Kidsgrove, Mow Cop and Congleton (see map) but these need no more than a passing reference as they do not come within the scope of this article.

Referring to the Uttoxeter and Cheadle services, 46 loop line trains leave Stoke in the course of a day, the first one departing at 5.25 a.m. and the last at 11.7 p.m. (11.10 p.m. Saturdays). This works out at practically the same average (viz., 23 minutes) as the down trains out of Stoke. Nineteen of the total of 46 trains terminate at Normacot 3¼ miles, and three stations from Stoke, 15 at Blythe Bridge 2½ miles, and two stations further on, and three at Cresswell, making an addition of 1¾ miles and one station. Four more branch off here on to the single line and run forward to Cheadle, 3⅞ miles and two stations from the junction, whilst the remaining five complete 9¼ more miles, and a call at one intermediate station before reaching Uttoxeter, the farthest point from Stoke served by the loop trains. Here good connections can usually be made for the Churnet Valley (Leek and Macclesfield) Ashbourne–Derby (North Staffordshire), Derby and Nottingham (Great Northern), Burton and Stafford lines. In addition to the four through trains to Cheadle from Stoke, two morning trains are run between Cresswell and Cheadle, giving a service from and to Stoke. Between Etruria and Uttoxeter all the Derby-Crewe main line trains travel over the same metals as the loop line trains and therefore give passengers additional facilities from most of the more important stations, but the same remarks apply to these as to the Stoke-Manchester trains,

Although Stoke has been considered as the centre from which to illustrate the loop line service, it must not be supposed that passengers from, say, Tunstall to Normacot, or vice-versa have to change trains at Stoke, quite the contrary being the case, as, with the exception of early morning and late night trains only very few commence, terminate or deviate in other directions at Stoke.

With reference to speed, although there are no 60-mile-an-hour fliers amongst these trains, speed performance is, on the whole very creditable, considering the gradients and close proximity (for the most part) of the stations. For instance, the journey from Uttoxeter to Leigh, 6 miles of all up-hill work ranging from 1 in 264 for 1⅛ miles to 1 in 120 (1⅝ miles) in 11 minutes start to stop, or 32⅔ m.p.h. approximately, is no mean achievement and reflects very favourably both upon the engine and her crew. Again at first glance the complete journey from Congleton to Uttoxeter taking 1 hour 32 minutes for a distance of 30½ miles (which, roughly speaking, is only 20 m.p.h.) looks very poor, but when one considers that the train has to make no less than 20 different stops, and incidently a like number of starts, some of which are on adverse gradients of as steep as 1 in 40 and under, it is immediately apparent that it would be practically impossible to cut down the timing. Another thing, the loop line was not intended to be, and I don't suppose is, used to any great extent for, comparatively speaking, long journeys such as the one under discussion, because through passengers can avail themselves of the frequent semi-expresses between the two towns mentioned, or even between either of them and Blythe Bridge, Longton, Stoke, or any other of the districts referred to previously, as served by main line trains.

However, to enable one to gather better what the end to end run is actually like, perhaps it will be as well to describe in detail the whole of the line served by the loop line trains, so let us imagine ourselves waiting on Uttoxeter Station for the train to start. Having a few minutes to spare we notice that immediately in front of the Stoke (or West) end of the station the

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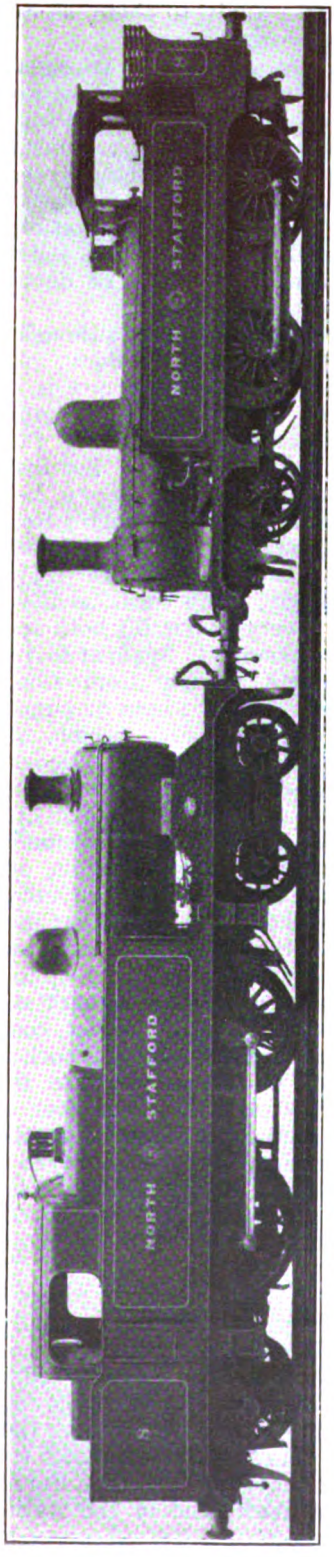

"THE OLD AND THE NEW": 2-4-0 TANK ENGINE No. 8 AND ITS SUCCESSOR, SUPERHEATER 4-4-2 TANK ENGINE BEARING THE SAME NUMBER.

railway forms a junction facing Derby, thus necessitating four platform faces, the extreme left hand one accommodating the Ashbourne and Churnet Valley departing trains, the next one to it being the arrival platform for trains from these two directions. Practically all the loop line trains also use these two platforms but, of course, arrive and depart at the opposite end, the arrival platform for a loop line train being the departure platform for a Churnet or Ashbourne train and vice-versa. The other two faces accommodate the Uttoxeter to Derby or Stoke main line expresses, also the four Great Northern Railway trains each way between Derby and beyond and Stafford. But let us proceed on our journey. A few seconds after leaving Uttoxeter we pass extensive sidings on either side and the engine settles down to her long pull up to Leigh. For the first two miles the gradient is 1 in 170 but just before passing Bromshall Junction, where Great Northern trains diverge to the left for Stafford, the incline steepens to 1 in 120 and this continues for a further $1\frac{3}{4}$ miles after which the comparatively easy $1\frac{1}{8}$ mile stretch of 1 in 264 takes us practically to our first stopping place. The start out of Leigh (12 minutes from Uttoxeter) has to be effected on an incline of 1 in 233, but soon it again eases, this time to 1 in 275 and continues thus to within $\frac{1}{4}$-mile of Cresswell. If we sit on the right hand side of the compartment whilst running into this station we notice that a single line joins us about 50 yards before drawing up, $9\frac{1}{4}$ miles from Uttoxeter, and this we discover is the previously mentioned Cheadle branch, but we will have a trip up this later on. Nineteen minutes from the commencement of our tour of inspection (if we are running to time!) we once again move on (and up) this time at 1 in 154 but only for a few hundred yards, for then we encounter our first bit of level track, $\frac{1}{4}$-mile in length, when we climb at 1 in 230 into Blythe Bridge, a distance of $1\frac{3}{4}$ miles from our previous stop and 24 minutes from Uttoxeter. Another minute occupied by "station duties" and then a further rise of 1 in 178 for close upon one mile, when the grade increases to 1 in 116 for about $\frac{1}{3}$-mile being the highest point between Uttoxeter and Stoke. On this peak we observe Cayerswall Signal Box and after

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a short sharp fall of 1 in 102 we reach Meir Station adding another 1½ miles and four minutes to our journey. This station is situated between high embankments, and soon after leaving it we run into Meir Tunnel, 814 yards long, and so on into Normacot, having taken two minutes to cover the one mile from our last stop. Thirty-three minutes of our allotted time should see us departing from Normacot, and here we notice a startling change in the landscape, for whereas up to the time we entered the tunnel green fields and small villages were in evidence now row upon row of houses, innumerable pottery chimneys and colliery sinkings (with their necessary attendant evils, slag heaps, &c.) take up the greater part of the view. But, proceeding with our trip, we find the next two stations are also only one mile apart from each other, the first to pass, Longton, for which but three minutes are allowed to arrive and depart from, on a down grade of 1 in 102, and the second, Fenton, where tickets are collected. Three-quarters of a mile from here, which we left five minutes after leaving Longton, we reach Stoke Junction the terminating point of a 1 in 96–97 descent extending back to Longton. Whilst passing this junction, on our left we can see a line coming in from Stafford and Colwich, the North Staffordshire Railway Company's roundhouse, and further back in a hollow their Locomotive, Carriage and Wagon Works, whilst on our right we notice another line joining ours, this one being the Biddulph and Leek branch, and behind this the coaling stage and running sheds. After a further ½-mile of practically straight and level track, we run into Stoke Station, having taken three minutes to come from Fenton. A like number of minutes are allowed here in which to take water, so we leave Stoke 47 minutes after leaving Uttoxeter and cover the 1¼ miles of slightly undulating grade to Etruria in another three minutes. (A ¼-mile from Stoke we noticed Newcastle Junction where the Market Drayton and Audley branch line trains diverge to the left.) It is directly after leaving Etruria (one minute since arriving) that we enter upon the seven miles of actual loop line. Our entry is effected by a sharp right-hand junction immediately north of the station. Between here and the next station (Hanley) the gradients are approximately 1 in 49 (⅛ mile) then 1 in 55 (¼ mile both ascending, next a few hundred yards of level, then 1 in 108 (⅛ mile), 1 in 40 (⅛ mile) also both up, and finally a drop of another ½-mile or so into the station of 1 in 204. It is just over 1 mile to Hanley from our previous stop and we are allowed 5 minutes to do this, including station time. The two succeding stations are each only ½-mile distant from each other, the first being Waterloo Road (time allowance 2 minutes) where ascending gradients of 1 in 161 and 1 in 67, have to be negotiated. A further two minutes are occupied in running on to Cobridge, and between the previous station and here a tunnel 286 yards in length and on a still ascending grade of 1 in 67 is passed. We start off for Burslem one minute later and drop at 1 in 190 for practically the whole of the ¾-mile into this station. To do this and also depart again we take three minutes, and also three minutes to get to, and away from, Tunstall one mile further on. The inclinations between Burslem and here are ½-mile down at 1 in 292, then ⅛-mile level and the remainder split up more or less equally at 1 in 90, 1 in 76, and 1 in 260 all ascending. Pitts Hill, ½-mile in advance, is reached and left in three minutes, and to do this we have to climb at 1 in 76 for ⅛-mile, and at 1 in 90 for the remainder, in two minutes, the odd minute being, of course, occupied with station duties. From this station (Pitts Hill) to Newchapel and Goldenhill it is one mile, and we climb at 1 in 76 and 1 in 148, the latter gradient, about ¾-mile in length, dividing the other almost equally in two. Three minutes is the running time allowed. One minute later and 74 minutes since we started our journey, we leave this station and enter upon our only section of single line, and cover the 1¾ miles of 1 in 100 up (⅛-mile) level (⅛-mile) and the balance of 1 in 40 down, to Kidsgrove in eight minutes (start to start). Strangely enough this timing is identical to that of trains running in the opposite direction, which, of course, is a much heavier run. About ½-mile before stopping we passed through our third and last tunnel, 88 yards long, and half-way between this and the station we noticed a "Halte" bearing the same name as the one we are

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now in, but it is only used on Saturdays. Leaving Kidsgrove we notice that we rejoin the main Stoke-Manchester line just beyond the station and we have thus completed the seven miles of "Loop Line." It may be mentioned that we do not go near the main line station at Kidsgrove (which goes under an altogether different name) as it is situated some few yards on the Stoke side of the junction, and is known as Harecastle. It is also here that we leave the Pottery towns, and once more enter beautiful rural scenery, this time on the borders of Cheshire. Between Kidsgrove and the next station, Mow Cop (2¼ miles) there are no gradients worth recording, in fact most of the distance is on the level and the generous running time of five minutes is allowed. After standing the usual minute we start off on our final stretch, 3¼ miles in length and practically level, and reach Congleton six minutes later, having been in the train a total of 94 minutes since leaving Uttoxeter.

Having covered by far the greater part of the Loop Line service, let us now return to Cresswell to enable us to complete our excursion by taking a trip up the Cheadle branch. As already stated this branch leaves the main line to Derby a short distance from Cresswell by a junction to the left, and is single throughout. After leaving the other metals, we climb practically all the way up to the first station, Tean, which is just over 1¼ miles from the junction. Actually the gradients are 1 in 240 (a few yards only) 1 in 3,080 (⅕ mile) both down, then 1 in 267, 1 in 178 (⅛ mile of each), 1 in 83 (⅕ mile) 1 in 98 (⅓ mile) 1 in 70 (⅛ mile) and 1 in 341 (1/10 mile) all ascending, while the final stretch of 1/10 mile or so into the station is on a descending grade of 1 in 664. To cover all this we are allowed 3 minutes. During the minute occupied with station duties we notice that there is only one platform and this is situated on the right-hand side facing the engine, whilst on the opposite side there is a short loop, but no trains pass one another here, as the staff we picked up at Cresswell takes us right through to Cheadle. Four minutes after leaving the former station we recommence our short journey, the start being accomplished on a rising inclination of 1 in 150, continuing thus for about ⅝-mile, when it eases to just half this (viz. 1 in 300) for another ⅛ mile. Next there is a very short length of 1 in 335, ¼ mile of 1 in 194, and another few yards at 1 in 336, all up. At this point we begin to descend at 1 in 181, but only for a very short distance, after which we run through a tunnel about 990 yards in length, still dropping, but at various different degrees of descent, there being gradients of 1 in 78, 1 in 64, 1 in 43, 1 in 99 and 1 in 429, all of more or less equal length. After descending a further one-tenth of a mile of 1 in 116 and 1 in 78, some colliery sidings and slag heaps may be noticed on the left, associated with the New Haden Colliery. The succeeding ⅛-mile is composed of gradients of 1 in 60 (⅛-mile) and 1 in 82, when we commence to climb again, the ensuing ⅓-mile being of 1 in 729 (⅛-mile), 1 in 93 (1/10 mile) and 1 in 67. Next we drop at 1 in 108 and 1 in 417 whilst the last ⅙-mile into Cheadle, 2⅝ miles and six minutes from Tean, is level.

Having now covered the whole of the so-called Loop Line and visited every station mentioned on the time-table applicable to these trains, a few remarks may be made in reference to the passengers carried. Between Uttoxeter and Meir inclusive (and of course including the line to Cheadle just described) and also between Congleton to Newchapel, the traffic is mostly composed of suburban residents who prefer to live in the country and travel backwards and forwards every day to their business (and such is the excellent service that many are able to get home to mid-day luncheon and be back in the Potteries again almost within the hour). On the other hand, the Loop Line trains between the actual Pottery towns, provide a quick and constant service for business inter-communication between the various districts, hence the considerably greater number of trains run on this section.

I think it will be agreed that the North Staffordshire Railway deserves mention amongst those railways which have met, and in most cases stimulated, a demand for a frequent and efficient service of suburban and inter-district trains.

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Traffic Working on the Midland Railway.

A description, in three parts, of the pioneer system of train control in Great Britain. All arrangements for the working of both passenger and freight traffic are centralised at Derby, and the distribution of rolling-stock is regulated by the Control staff.

II. FREIGHT TRAIN OPERATION.

By CHARLES TRAVIS, M.Inst.T., Joint Author of "Practical Railway Working."

THE principal reason for the adoption of a control system is the more effective regulation of freight train operation, and, while, as will be noted in my next article, the Midland (and also the Lancashire and Yorkshire) now "control" passenger trains, the great utility of this system of regulation lies in its value on the freight side.

Wellington, the famous American writer, defined the principles of freight traffic operation as (1) to save train and engine-miles, (2) to load trains to full capacity, and (3) to move them as quickly as possible, and it may be said that these are the real aims of train control as applied to freight traffic. An additional duty undertaken on the Midland (though not on other lines) is the distribution of rolling-stock by the control.

The Midland scheme of control is essentially a centralised one, but on such a big system it is necessary to decentralise the immediate superintendence of train movement, and this is effected by the division of the railway net-work into 25 areas, each in charge of a district controller, who has definite responsibility over *operation* within his area.

During the time I was engaged in studying the working of the Midland train control system facilities were accorded me for the inspection of the Masboro' and Chaddesden district offices, and, as the district control office is the key to the actual movement, it will be well briefly to review the methods of working there.

District Control Office Equipment.

Exterior and interior views of the Masboro' district control office were given in last month's issue of the RAILWAY MAGAZINE. The control office is a large airy room equipped with 17 telephonic instruments, including three superimposed phonopore circuits, while in the district controller's private office there is an additional instrument. From these lines it is possible to speak to the various reporting points in the area, and also, by means of special switching arrangements at Derby, to effect communication with 160 signal-boxes, sidings and depôts.

The control staff in the Masboro' area comprises the district controller, whose orders with regard to train operating are binding upon all in the area, three controllers, who work in eight-hour shifts from 6 to 2, 2 to 10, 10 to 6, nine assistant controllers working three in each shift, three relief controllers and one extra man who takes a daily turn and attends specially to rolling-stock matters. Thus the total staff of this important control office aggregates 17, which number is sufficient to have an expert operating staff available at any hour of the day or night to deal with operating problems.

On entering the Masboro' control office the first thing noticed is the comprehensive telephonic installation, and, secondly, the two large train boards, one of which is illustrated on page 298. Another feature of this control office, clearly shown on page 302, is the revolving diagram. In a glass frame situated about 3 ft. from the floor, and in the middle of the control office, the diagrams relating to the area are arranged on rollers so that the section dealing with any particular period of the day may readily be turned up for scrutiny. In practice, however, constant reference to the diagrams is unnecessary, as the controllers become thoroughly familiar with the workings, and are, therefore, well informed as to the train timings.

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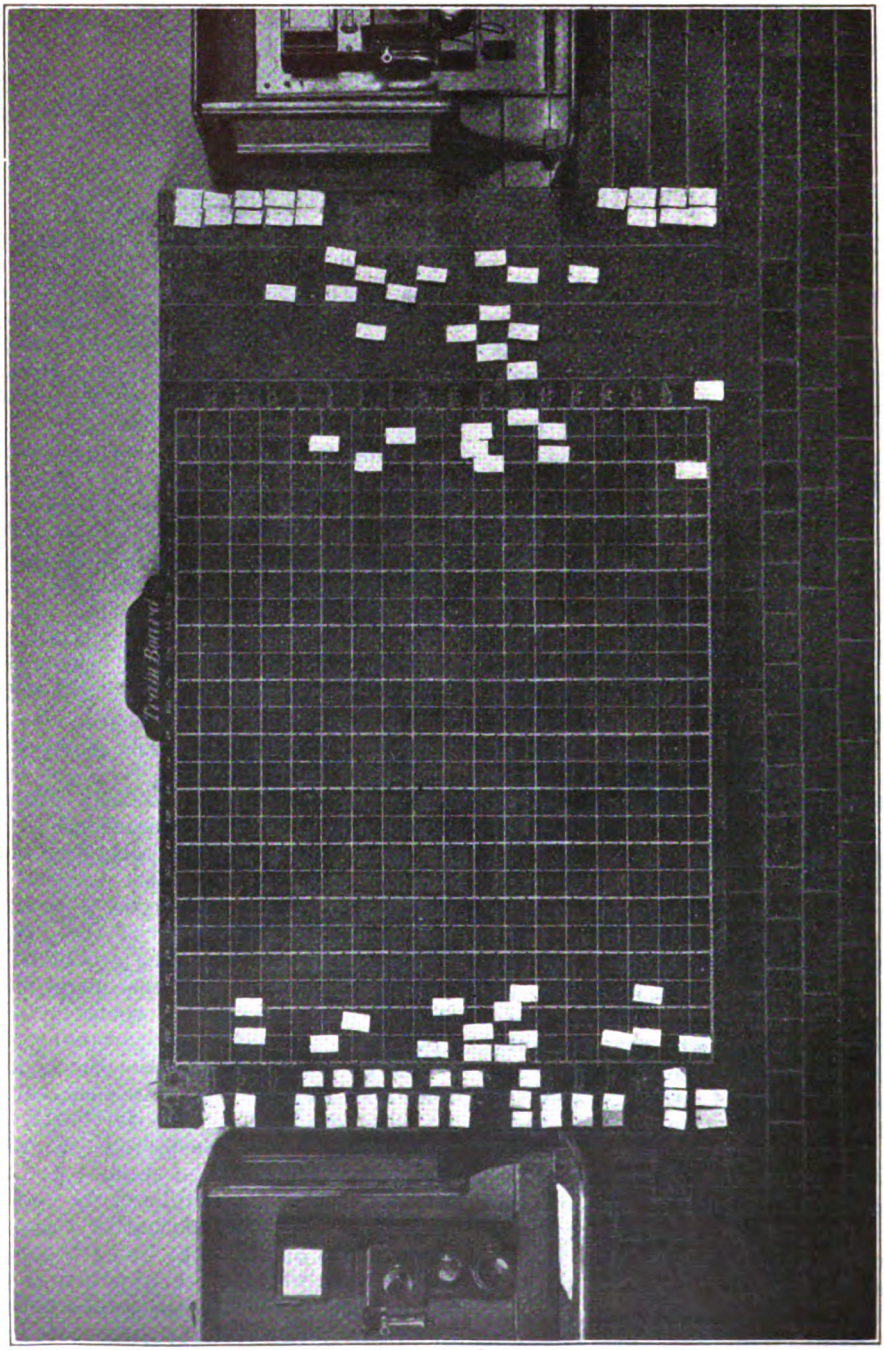

ONE OF THE TRAIN BOARDS USED IN CONNECTION WITH FREIGHT TRAIN WORKING, MASBORO' DISTRICT CONTROL OFFICE.

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Train Board and Control Tickets.

The train boards in the Masboro' office, which are used to record the movements of freight trains in that area, contain spaces for "Traffic to be Moved," "Names of Important Stations," Time (with holes placed at 5 min. intervals), "Shunting Engines," "Trip Engines," and "Trains out of Area." The particulars entered on the cards inserted in the "Traffic to be Moved" column are prepared from information supplied to the district office by the various depôts and sidings every two hours throughout the day. This information is also entered on a sheet which indicates the accommodation of the depôts and sidings, and observation is maintained to ensure that no congestion arises.

The main portion of the train board is used to record the movement of trains as they are reported on their journey through the area. In addition to moving the card forward details of the running of each train are entered on the reverse side. The sections allocated to shunting engines and trip engines show the number of each class in service and the tickets take their place on the main board immediately the engines commence to run over the main lines. Where they are shown in their appropriate columns they are actually off the running lines. The last column is reserved for the cards of trains which have passed out of the area and are subsequently returning, when the cards are returned to the main board.

The tickets bear distinctive colours to indicate various classes of trains. Thus, a salmon-coloured ticket indicates an up train; a white ticket with black printing, a down train; a white ticket with red printing, shunting or trip train; a white ticket with green printing, a double trip train, while a yellow ticket is used for a relieving driver and a blue ticket for a relieving guard.

Traffic Advices to District Control Office.

At 8 a.m. each day information is communicated by the various reporting points to the district control office as to:—

(*a*) Number of goods brakes on hand and number booked to arrive and depart during the next 12 hours.

(*b*) Number of wagons stored in the area and where.

(*c*) Total number of wagons stopped, and

(*d*) Total number of wagons held waiting consignees' acceptance and where.

In addition, traffic advices are received every two hours giving information as to the amount of traffic on hand at the various sidings and depôts in the area. The traffic sheet entries are, therefore, adjusted every two hours throughout the day. The control office is also advised every two hours as to the amount of traffic offering for the trip services, and from his knowledge as to the capacity of the booked trains the controller is able to see whether the service will be in excess of or below the requirements, and to arrange for the cancellation of certain trips, or the running of extras as required. The special watch maintained on trip services by this means has proved of considerable advantage, in that it has enabled the collieries, works and depôts to be given a more effective supply of empty wagons while the work has been performed more economically.

Relief Arrangements.

Apart from the information as to the booking-on times of trainmen shown on the tickets, a careful watch is kept on the workings in order to ensure that the men are relieved before they have been on duty unduly long hours. This is done by means of a trainmen's relief record. On this sheet the booking-on time of enginemen and guards is entered, and the general position with regard to relief can thus be seen at a glance.

Another record is maintained in connection with relief work. This is a small board divided into sections, "Spare men at" and "Men waiting work," and in each of these sections tickets are inserted showing the respective classes of men available. The record is useful as showing the points from which men may be drawn for relief purposes.

Traffic Restriction Procedure.

It is by no means unusual in railway practice for a consignee to find he cannot accept traffic coming forward for him, and it is then desirable, if congestion is to be avoided, to restrict the despatch from the starting point, and, if traffic is *en route*, to berth it at some convenient place. In Midland practice such cases are notified to the district controller, and if the traffic originates within his area the sending station is advised to hold traffic until

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M.R. Co. P.S.F. 949 0—8/14.

PARTICULARS OF TRAFFIC STOPPED OR RESTRICTED.

STATIONS OR COLLIERIES FROM WHICH TRAFFIC STOPPED OR RESTRICTED.	STOP OR RESTRICTION PUT ON.						STOP OR RESTRICTION REMOVED.			
	DATE.	TIME.	NO. OF WGNS. PER DAY.	WHOM ADVISED.	TIME.	CARD SENT.	DATE.	TIME.	WHOM ADVISED.	TIME.

TRAFFIC STOPPED OR RESTRICTED CARD, RETAINED IN DISTRICT OFFICE.

further orders. If, however, the traffic arises in another area reference is made to the central control which regulates the traffic in accordance with the requirements.

When an intimation as to the necessity of restricting or stopping traffic reaches the district control office particulars are entered on a card, and another card is sent to the point affected. The latter card contains an endorsement to the effect that "This card is to be returned to control office immediately the stop or restriction has been removed," and so long as it is held by the station it constitutes the authority for not accepting traffic—or for accepting it merely in the limited quantities stated. The back of the card retained at the control office contains columns for the insertion of particulars as to the number of wagons held back at various points, so that at any time full information is available as to the amount of traffic offering for transit. These cards are reproduced above and below.

Supervisory Arrangements in District Office.

In order to observe continuity of supervision it is essential for the head controller on each shift to have some method of transmitting information as to anything of a special character to the relieving controller, and this is done in two ways. Firstly, the relieving controller is briefly "taken through" the position on the train board, and anything out of the ordinary is thereupon discussed. Secondly

M.R. Co. P.S.F. 949. O.—12/13.

PARTICULARS OF **OUTWARDS** TRAFFIC STOPPED OR RESTRICTED AT.....

CLASS OF TRAFFIC.	CONSIGNEE.	DESTINATION.	STOP.				RESTRICTION.				
			PUT ON.		TAKEN OFF.		PUT ON.		No. OF WAGONS PER DAY	TAKEN OFF.	
			DATE.	TIME.	DATE.	TIME	DATE.	TIME		DATE	TIME.

THIS CARD TO BE RETURNED TO CONTROL OFFICE IMMEDIATELY THE STOP OR RESTRICTION HAS BEEN REMOVED.

TRAFFIC STOPPED OR RESTRICTED CARD, SENT TO STATION CONCERNED.

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information as to delays or anything out of the usual course is entered in a diary, which constitutes the principal record maintained in the district office. It is on the information in this diary that the district controller primarily relies in his daily consultation with the superintendent of freight trains, and it is, therefore, of the utmost importance that the diary should properly be utilised. Misunderstanding as to the traffic position is entirely avoided by this system of discussion on the general working and written record of anything out of the ordinary, while the district controller each morning deals with anything requiring his personal attention before the conference with the superintendent of freight trains, as described last month.

CENTRALISED SUPERVISION.

The work of the district control offices is co-ordinated, and important freight train movements supervised, by the central control office at Derby, special statements showing the trains under definite classifications and indicating running times being used for the latter purpose. There are four of these statements, both up and down freight trains being divided between "London" and "provincial" sections. These sheets contain printed information as to the scheduled working of each train, and thus enable the controller concerned to follow the running as the trains progress. Particulars are entered on the sheets as to any late start involved, minutes late out of the various areas, arrival time at destination, and explanations of abnormal working.

By this means information is readily available with regard to any late running, and it is certainly an improvement as compared with the system whereby train delays are the subject of interminable correspondence between departments. The Midland method fixes responsibility for delay at the time of occurrence, it furnishes a ready appeal with regard to proposed changes in working, and has the additional advantage of exercising a good moral effect upon the men.

Two other special forms having particular reference to Midland mineral

FREIGHT TRAINS. P. S. F. 48. 0 25—1 side—10, 20.

ARRIVALS AT DESTINATION.

Week ending DECEMBER....4TH, 1920.

Service.	Day.	Arrivals at destination. Number of trains. Punctual.	1 to 15 mins. late.	16 to 30 mins. late.	31 to 45 mins. late.	46 to 60 mins. late.	61 and over mins. late	Total No. of Trains.
WELLINGBORO TO LONDON	Mon.	5	3	5	1	1	-	15
	Tues.	10	5	1	-	1	-	17
	Wed.	9	4	3	2	-	-	18
	Thurs.	8	3	1	4	1	1	18
	Fri.	6	7	4	-	1	-X	18
	Sat.	13	1	2	1	-	1X	18
	Total	51	23	16	8	4	2	104
LONDON TO WELLINGBORO	Mon.	9	4	1	-	-	-	14
	Tues.	9	5	3	3	-	1	21
	Wed.	11	5	3	1	2	-	22
	Thurs.	9	10	1	2	-	-	22
	Fri.	8	8	3	3	1	-X	22
	Sat.	2	5	6	5	2	2X	22
	Total	49	35	17	14	5	3	123
	Mon.							
	Tues.							
	Wed.							
	Thurs.							
	Fri.							
	Sat.							
	Total							
	Mon.							
	Tues.							
	Wed.							
	Thurs.							
	Fri.							
	Sat.							
	Total							

* Mishap. † Loco. § Fog. ‖ Wind. ×Gale.

CARD SHOWING PUNCTUALITY RECORD OF COAL AND EMPTY WAGON TRAIN RUNNING, PREPARED WEEKLY FOR GENERAL SUPERINTENDENT.

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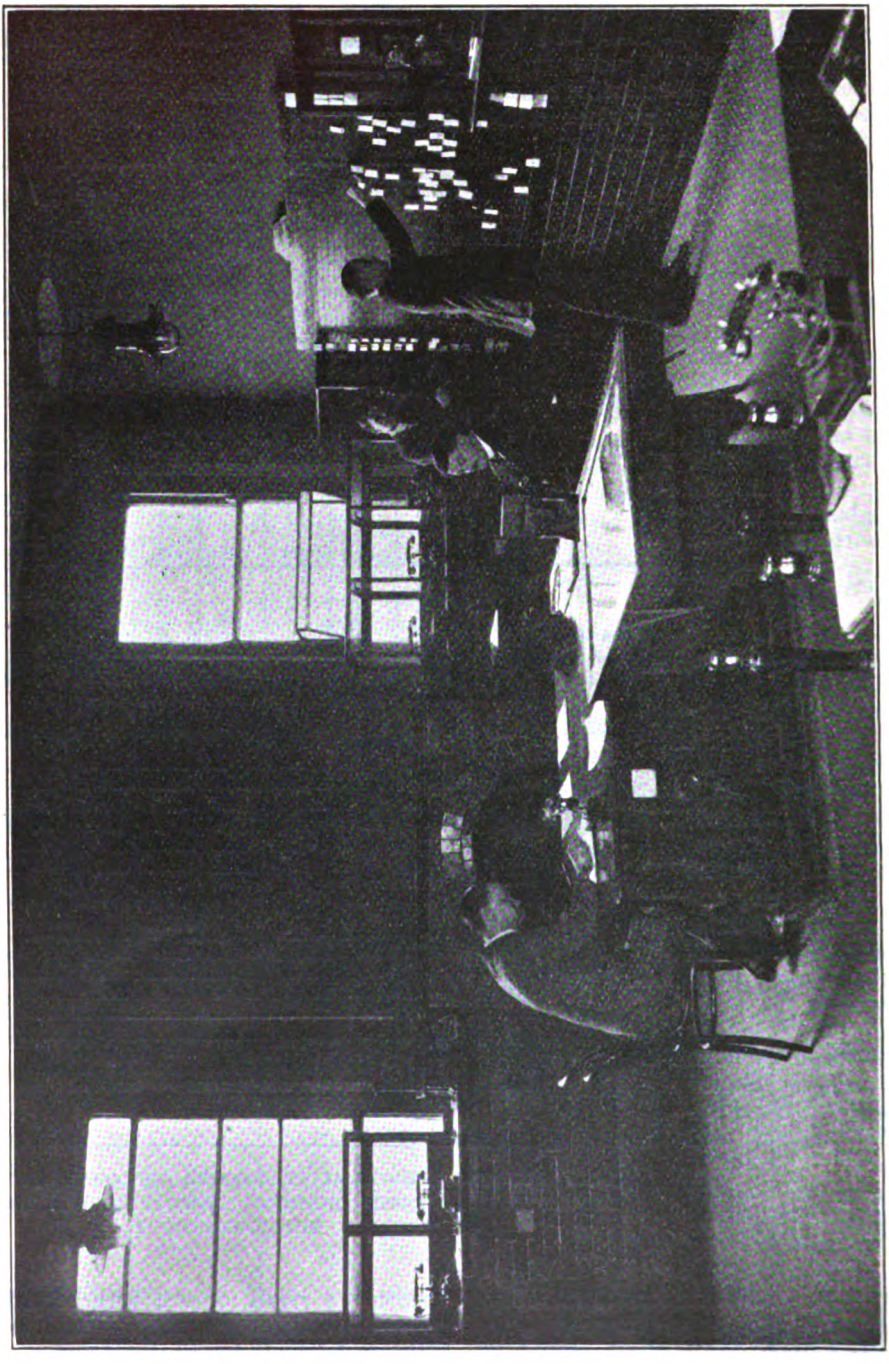

GENERAL VIEW OF THE MASBORO' DISTRICT CONTROL OFFICE, SHOWING TELEPHONIC EQUIPMENT, TRAIN BOARD, TRAIN DIAGRAM CABINET AND RELIEF DESK.

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traffic are maintained in the central control office. These are somewhat similar to the statements mentioned above, but include a summary from which information is given as to arrivals at destination, this showing the number of trains punctual, those late at various points, the total number of trains, and the number double-headed. The Midland carries a very heavy coal traffic to London and the South, and it is worthy of record that the trains are now so well "pathed" that a high percentage of punctuality is obtained. A special difficulty in the working is that all the coal trains for London, as also those for Peterborough—at which point the Midland transfer a heavy coal traffic to the Great Eastern—converge at Melton, where there is only one up and down line. It is essential, therefore, to avoid congestion, that the working past this point should be closely watched, and this is done to such good purpose that between 65 and 75 per cent. of the loaded coal trains passing Melton are punctual. As the coal traffic worked past this point is drawn from 11 different centres this record of the running of trains through Melton gives a good indication as to the general working of coal traffic in the "up" direction.

Cards are prepared for the information of the General Superintendent to show the running efficiency of these trains. During the week ended December 4, 1920, 104 loaded coal trains were run from Wellingboro' to London, a distance of 60 miles, 51 were punctual, 23 less than 15 min. late, and 16 between 16 and 30 min. late. Of 132 trains run in the reverse direction, 49 were punctual, 35 less than 15 min. late, and 17 betwen 16 and 30 min. late.

Regulation of Coal Traffic.

The coal traffic for the London area is specially regulated in order to equalise the flow according to the requirements of the various consignees. This is done by means of a systematic record taken at the 33 Midland (London) depôts, showing the exact position with regard to each merchant's traffic, and the compilation of a statement in the central control office on which action is taken as to expediting or retarding traffic towards London.

Shipping coal also is the subject of special regulation, and by means of a cross-card system the central control is able to follow through the arrangements for the working, and the actual running of each "parcel" of traffic. The section dealing with shipping coal utilises a small board indicating the coal-producing areas of the Midland Railway and showing the storage points available for the reception of coal traffic awaiting release. This enables those concerned to utilise storage facilities to the full and to ensure that too much traffic is not despatched by the collieries in the absence of shipping instructions. A form is maintained in connection with each "shipment," this giving particulars of quantity and class of fuel, consignee, ship, number of wagons actually loaded and the date, number of wagons worked away from the colliery

MIDLAND RAILWAY. P. S. F. 976.

Date .....

Coal Traffic for ..... **held in** ..... **area.**

Date on Label.	WAGON.		Colliery from	Station to	Route.	Consignee.	Where Standing.	
	Owner.	Number.						

RECORD OF WAGONS LOADED WITH COAL FOR LONDON DISTRICT.

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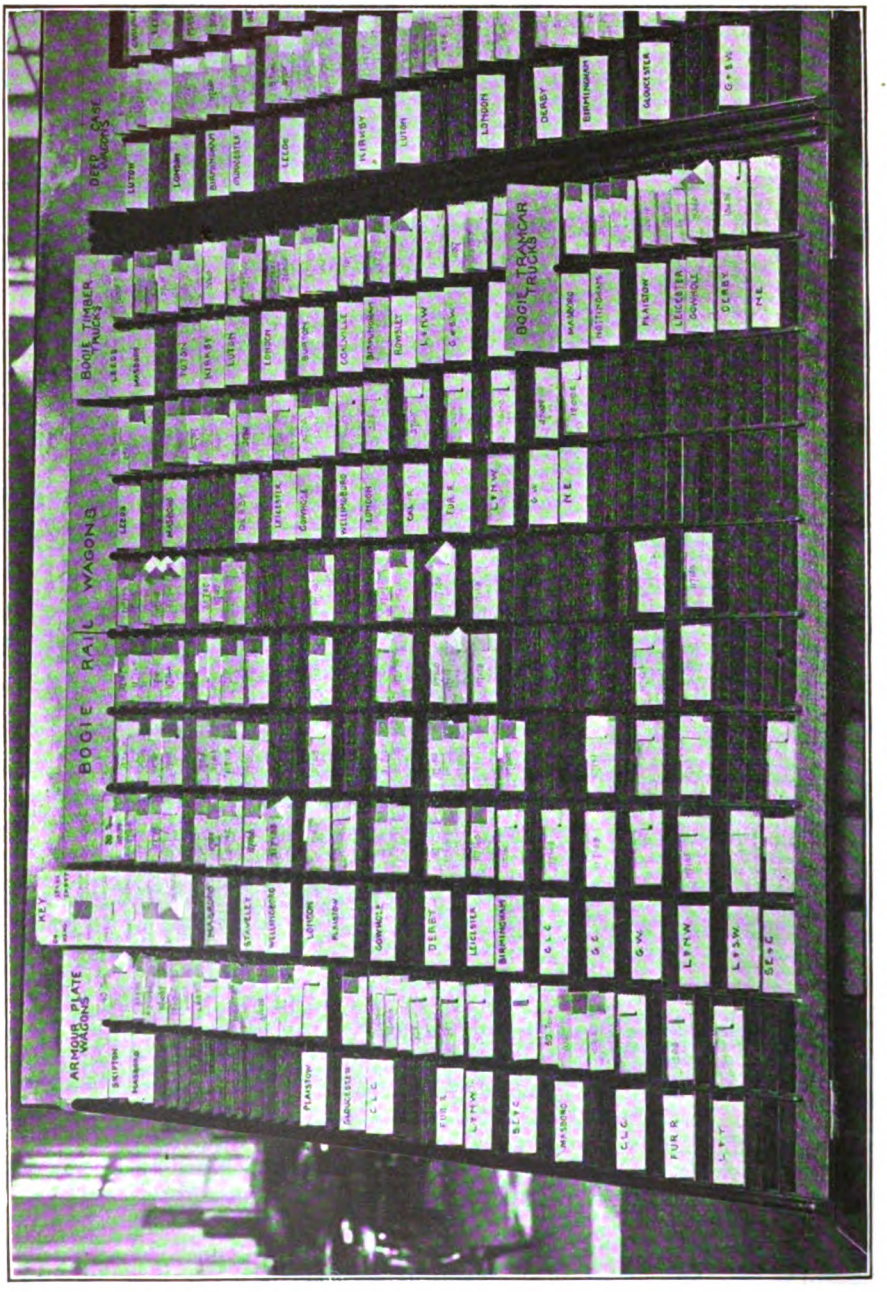

SECTION OF CABINET WITH FREIGHT TRAIN ROLLING-STOCK INDICATORS IN POSITION, CENTRAL CONTROL OFFICE.

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and the date, and an indication as to where any traffic is stored.

GENERAL CONTROL ARRANGEMENTS.

While the central control office does not in the ordinary way interfere with the working of trains working locally in a control area it exercises a close supervision upon those passing between areas. No district control may arrange a path without sanction from the central office, and no change in the booked arrangements must be made without central control authority is given.

Particulars of loaded and empty wagons worked away from the various areas are sent to Derby each day, separate forms being used for those conveyed by express freight and ordinary trains respectively. The information shows the number of wagons despatched to 44 destinations and transfer points, and the concentration of this information at headquarters gives the central control a valuable indication as to the extent and direction of traffic movement.

Among other forms received by the central control is one detailing the number of double-headed trains started from each control area, while the central control also compiles several statements of special importance from the written and telephonic particulars obtained. One such statement is entitled "Exchange with foreign companies," and shows the number of wagons from and to each company at the various junctions. Finally, reference may be made to the special traffic statement, which is compiled each morning at 8 o'clock to show traffic on hand, surplus traffic on hand, traffic for foreign companies and traffic for Midland stations. This form also indicates the traffic in each control area waiting to be moved to the various points specified. Additionally information is compiled each morning to show in the case of each control area what lines are blocked and the classes of traffic involved, a general position chart being prepared at 4 o'clock to show how each area stands with regard to traffic.

These brief remarks give some little indication as to the manner in which the Midland have developed a comprehensive scheme for the regulation of freight traffic movement and in the concluding article, to be published next month, I propose to outline their methods with regard to passenger train operation.

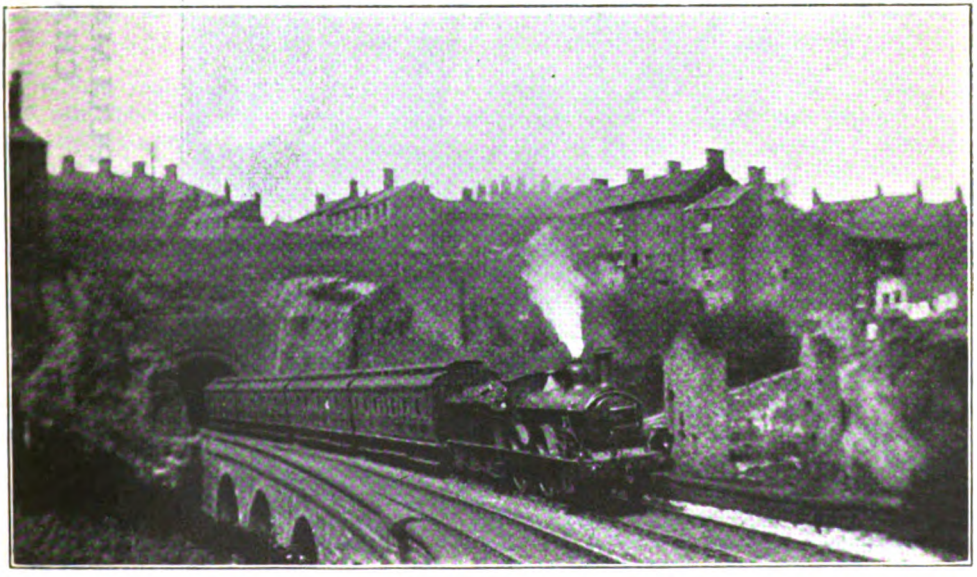

Photo.] MIDLAND RAILWAY. [*R. D. Pollard.*

Manchester-Chinley train emerging from tunnel at New Mills. 2-4-0 engine, No. 146.

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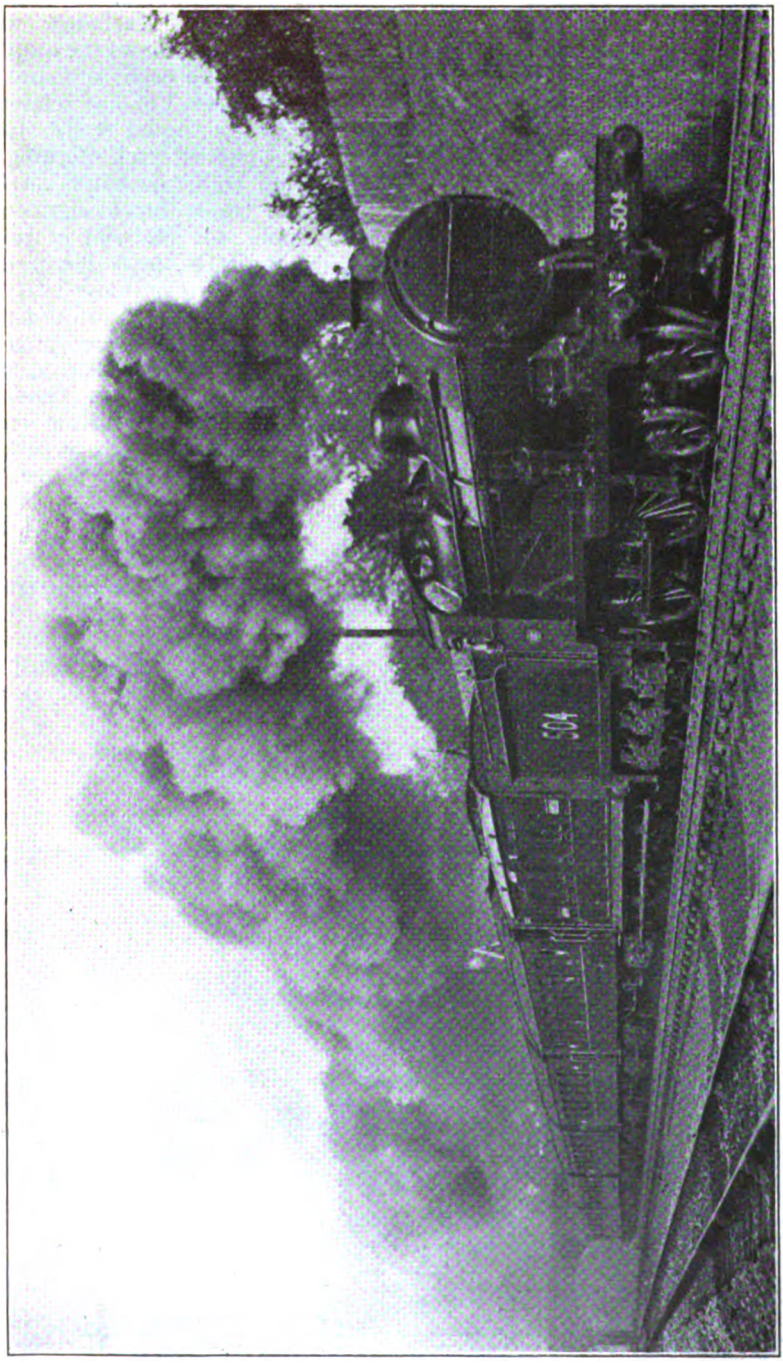

Photo. [*F. E. Mackay.*

"THANET PULLMAN LIMITED," SOUTH EASTERN & CHATHAM RAILWAY.

Rebuilt Superheater 4-4-0 Locomotive, No. 504.

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The Colour Problem in Railway Signalling.

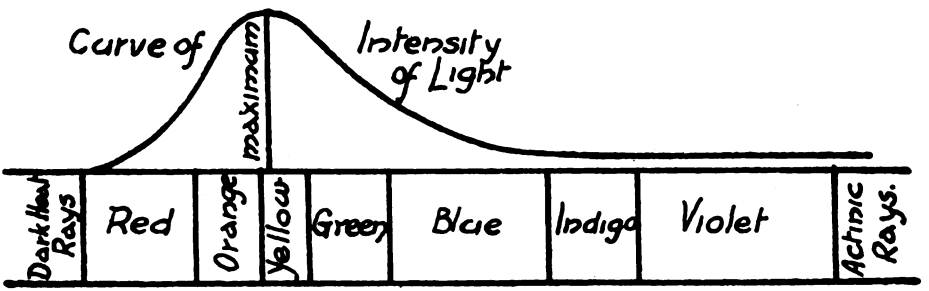
IN some respects an old cause of controversy, which had, for all practical purposes, apparently been settled, the colour problem in railway signalling, is again arising. White has, advisedly, ceased to be used at all, except to a very limited extent for ground signals, and then usually when a definite clear indication is to be given. Purple, too, is employed only for subsidiary purposes, and for running signals red and green are almost universally standard, with yellow as an intermediate indication, to raise the question of possible uncertainty under some conditions of observation.

As a slow or medium speed signal light, yellow has realised considerable acceptance, and special attention has been given by manufacturers to ensure that the yellow glass used shall give a colour which is as nearly as possible free from risk of misunderstanding or incorrect colour suggestion. Whether employed on underground or urban electric railways, or in connection with three-position signalling, there is much to be said for it, and it is so far accepted as satisfactory that the main questions which arise in reference to it relate to its efficiency and trustworthiness on main line high speed railways, especially when fog and mist are about, and the possibilities of confusion with street and other lights which are always liable to be included in an engineman's "look ahead" at night.

As is generally known, the effect of coloured light is usually obtained by filtering the rays emanating from a white light source through a coloured screen, such as coloured glass, which functions in stopping rays of a widely dissimilar wave-length from passing.

It is not intended here to enter into the deeper technicalities pertaining to the subject of light, and the object is solely to explain, as briefly as possible, the reason why the general adoption of coloured media other than red and green should be refrained from.

Daylight, which is known as white light, is composed of all seven colours which form the visible spectrum: they are Red, Orange, Yellow, Green, Blue, Indigo, and Violet. The full spectrum



contains other rays than these, but are invisible to the human eye, and consist of dark heat rays preceding the Red, and actinic rays following the Violet.

The diagram indicates the arrangement of the colours in the visible spectrum, and the curve superimposed indicates how the intensity of light varies along it. The only essential difference between the rays emitted by the different colours of the spectrum is that of wave length, which continually decreases from the red end.

It must not be assumed that the colour of the light is constant throughout the divisions indicated above; on the contrary, it is continually varying. Take, for instance, yellow light. Beneath yellow in the spectrum comes orange and red, and above it there is green. Now for purposes of explanation let it be imagined that rays of a wave length which will produce pure yellow light are only emitted

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from a band 1/100th of an inch wide, drawn vertically across the centre of the division marked yellow. On either side of this narrow band are emitted rays of nearly, but not quite, similar wave length, and as the centre belt is departed from either to the left or right, so the wave length of the rays becomes at greater variance with those emanating from the centre band. As the orange and reds are approached, so the wave length increases and more and more orange and red rays are intermingled with the yellow, producing increasingly deeper shades of yellow-reddish tint. On the other hand, as the green division is approached, the wave length of the rays becomes shorter, and the light of continually increasing green-yellow appearance.

Now this being the case, it necessarily follows that in order to obtain a light of a pure colour, only a minute part of the total rays emitted from any division on the diagram may be allowed to pass through the filter, but obviously only light of totally insufficient power for practical purposes could be so derived, and in practice it is necessary to use rays emitted from a far greater area in order to obtain sufficient power to give the light its required range.

Consequent upon this fact, normal signal lights exhibited are never really true to colour, but light rays of many various wave lengths are allowed to filter through the coloured media employed.

Observations of lights so filtered, made under good visibility conditions, show that yellow light, orange-yellow or even orange, is from a distance not exceeding half its normal range unlikely to be mistaken for red by the practised eye, but that a pale yellow or a light green-yellow, even under the best conditions of visibility, may be easily mistaken for a green light. But bearing in mind the fact that atmospheric conditions are a remarkably variable quantity in this country, it is necessary to consider the effect upon lights of impurities (such as smoke, dust and slight fog, etc.) suspended in the air.

It is a known fact that impurities in the air have the effect of making all lights appear to be lower in the spectrum than actually is the case. Thus, a light of normally white appearance will appear yellow, a yellow light orange, and an orange light red. This rule applies to a greater or less extent throughout the whole spectrum, but especially are the yellows and blues affected. The cause for this apparent change of colour is probably mainly due to the fact that the impurities enhance the apparent degree of saturation of the filter; thus the rays of short wave length, which normally reach the eye of an observer through a medium of given colour, are scattered and lost.

There are, of course, many points of vital importance such as intrinsic brightness of the light source employed, degree of saturation of the filter, etc., which directly pertain to the subject under discussion, but the result of tests and observations made under widely different conditions all tend to prove that neither any form of yellow or blue light may be used in this country for the purpose of conveying definite and important information to an observer approaching such a signal light at any appreciable speed.

In some respects, the fact that a yellow light tends to become orange under some conditions of observation is an error on the right side, seeing that misreading a "caution" signal as "stop" does not introduce an element of danger. But if the tendency should be towards green, it may have the effect of suggesting "clear" instead of "caution," and although this may be relatively slight, seeing that a greenish yellow must usually tend very decidedly towards green if it is to cause misunderstanding, this possibility must be considered.

There is, however, another source of possible confusion which may have even worse results. That is the relative strength of a yellow light as compared with a corresponding green or red, and the fact that it is so similar to ordinary street and town lights, which themselves tend towards yellowish effects.

On local electric railways yellow signal lights are observed mainly under favourable conditions, and but rarely do they need to be seen from considerable distances. On a main line, however, unless seen clear of town and street lights, there are distinct possibilities of confusion. Even a white back light of a signal for the opposite direction, if clouded by smoke and steam, and giving a distinctly yellow suggestion, may be accepted, momentarily

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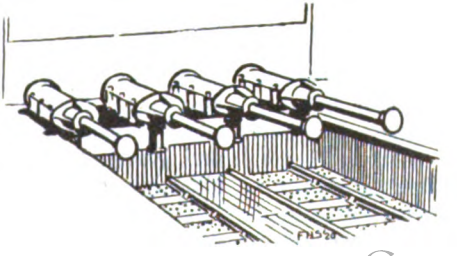
if not conclusively, as a more distant yellow light presented to the observation of a driver of a high speed train. And where town lamps are numerous, with varying strengths and qualities of alleged white light, a driver may be forgiven if now and then he becomes uncertain as to a yellow signal light displayed to him, or in a group of signal lights accepts a street lamp whose light apparently occupies the position of a yellow light he expects and by its relative strength overpowers the darker red which is actually shown.

High speed and far-away observation is, in fact, the chief test of colour signalling, and although it is only proposed to use yellow as a "caution" indication, and even if it is mistaken it will still be accepted on a "go carefully" basis, yet this possible cause of misunderstanding must be given emphasis.

But having indicated possible weaknesses attending proposals to make yellow the standard "caution" indication, it is only just that destructive criticism should be followed by constructive suggestion. The yellow light is being introduced as the only colour of practical value to form a third with red and green, and if it is to be dispensed with, or is not to become general as a standard colour for signal lights, the only alternative is to adopt some other means of differentiating between stop and distant signals.

Two systems are, however, already in considerable use. One is the illuminated fishtail which has been accepted to a large extent, but is not altogether satisfactory owing to the fact that the white light alongside red or green tends somewhat to obscure and confuse the latter. The alternative is to use flashing or occulting lights for distant signals, rendering them distinctive at all times. Mechanical or electrical devices can be used for this purpose, or automatic appliances, such as those used on the Furness Railway, and to a considerable extent on certain foreign railways in Europe. The observational effect realised is quite distinctive, and apparatus is available which appears to satisfy all practical and maintenance requirements.

In the *Bulletin of the International Railway Association* for January, 1913, Mr. J. F. Gairns contributed a study of the possibilities of flash signalling in British railway practice, in which the conditions which various applications would create were discussed at length, with several interesting diagrams of simple and complicated signal lay-outs. The opinion arrived at was that flashing distant signals afforded a ready means of differentiation, though on multi-track sections it would be best to fit only the high speed main route distants to avoid possible confusion. This opinion may be again brought forward, that the flashing light provides the best solution of the distant signal colour problem yet available. The main difficulty now, indeed, in advocating this measure is the growing vogue of the three-position signal, in which stop and distant signals are combined, so that the flashing mechanism would not always be required. Surely, however, it is within the reach of mechanical ingenuity to provide a simple device, whereby while red is shown for both the danger and the caution indications, thus erring, it may be, on the side of safety, the flashing mechanism operates only during the display of a cautionary red and while green is shown, the latter to differentiate a three-position signal green from one applying on a two-position stop basis.



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Locomotive and Train Working in the latter part of the 19th Century.

THE FURNESS RAILWAY. [No. II.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

MENTION may now be made of the six banking engines, similar to No. 68, which were used to bank mineral trains in both directions over the Lindal banks from Askam on the Barrow side and Plumpton on the Ulverston side. Their chief outward characteristic was the long side tanks, with rectangular openings through which the motion could be oiled. They had 4-ft. 6-in. wheels and 18-in. by 24-in. cylinders. These engines carried 140 lb. pressure, and, as befitted their onerous duties, had the largest boilers then to be found on the line, with a total heating surface of 1,111 sq. ft. They weighed 44¼ tons in working order.

A miscellaneous lot of six-coupled mineral tank engines, chiefly double-framed saddle-tanks by Messrs. R. Stephenson & Co., need not be described. They were taken over in 1878 with the Whitehaven, Cleator and Egremont Railway, and always worked in that northern corner of the Furness system. By the end of 1881 there were 119 engines on the line.

The hematite iron ore, for the carriage of which the Furness Railway largely exists, is responsible for the colour of the engines. The locomotive stock may have been painted another colour in its early days, but, as far back as I remember, it was always brick red. In those days, however, the carriages were not of the dark blue and white colours of the present day, which is such as to make them somewhat indistinguishable from the London and North Western stock, but were of a chocolate colour or of varnished teak.

The train service in 1880 showed nothing very striking in the way of performances. The early morning down

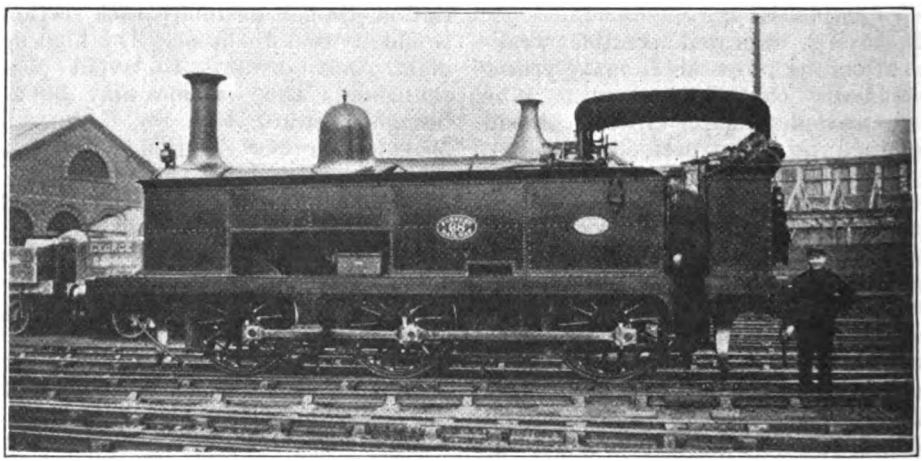

Photo.] [*Loco. Publishing Co., Ltd.*

0-6-0 BANKING TANK LOCOMOTIVE No. 68.

Built by Sharp, Stewart & Co., Ltd., 1872. Coupled wheels, 4 ft. 6 in. diam. Cylinders, 18 in. by 24 in.

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mail train left Carnforth at 4.40 a.m., and reached Barrow (about 28½ miles) at 5.55 a.m. The best down train timing was 1 hr. 10 min. between the two places, this being allowed for the 4.5 p.m. from Carnforth (London and North Western Railway) and the 12.30 p.m. from Carnforth East Junction signal-box. The latter was the Midland Isle of Man boat train, which left Leeds at 10.32 a.m. and travelled direct, after changing engines at the signal box, without entering Carnforth Station.

The best up trains, of which there were three, all took 1 hr. 5 min. from Barrow to Carnforth. It must not, however, be forgotten that a stop of 5 to 7 min. was required at Furness Abbey or Dalton for disconnecting and connecting the Whitehaven portions, and this occurred in both directions. For instance, the 7.30 p.m. up mail from Whitehaven ran direct over the old line to Dalton Junction, where it arrived at 8.50. The engine and front coaches were then detached and waited for the Barrow portion, which left there at 8.40 p.m. The combined portions departed from Dalton at 8.55 p.m. and reached Carnforth at 9.45 p.m., with stops at Ulverston and Grange. This, by the way, was the best train which the Furness Railway then had. The other portion of the Whitehaven train, detached at Dalton, was worked into Barrow with another engine.

By this time Barrow had attained considerably more importance, and had to be placed on the main line instead of being relegated to an obscure siding. The result was the opening in 1882 of the new Central Station. As far as mileage was concerned, the scheme was a doubtful form of "betterment," for the main line passenger trains, which from this time went through Barrow on their way between Carnforth and Whitehaven, had no less than 7½ miles added to their route, and, needless to say, the company charged no more for the extra distance.

There was a distinct improvement in the timing of one or two trains in 1887–8. Although the 7.30 p.m. from Whitehaven, which took 2 hr. 15 min. in 1880, was now given 2 hr. 22 min. for the 74¼ miles journey to Carnforth, it should not be forgotten that the train now made the detour via Barrow Central Station, which added 7½ miles to the distance. Foxwell gives the inclusive speed as 31½ m.p.h., and the speed exclusive of stops as 36 m.p.h. He adds that this, a semi-stopping train, ran faster than several trains on the Continent which charged first and second-class express fares. Nevertheless, the pride of place, which had once belonged to this train, was now taken by a through Midland train, the 3.35 p.m. from Leeds, which covered the 28½ miles from Carnforth to Barrow (Central) in 45 minutes, a vast improvement over the old timings. The speed of this train, exclusive of stops, was 40¾ m.p.h. and 38 m.p.h. including stops.

The above trains were worked by the small 2–4–0 engines previously described, since there were no others then available. But in 1890 there appeared a new class of 4–4–0 engines, Nos. 120 to 123, and in this case again the Furness followed a lead given by the Cambrian Railways, which had six of the same class built during the period 1878 to 1891. They were of Messrs. Sharp, Stewart's design, and had 5 ft. 6 in. coupled wheels, 17 in. by 24 in. cylinders, and 140 lb. pressure. The total heating surface was 1,041 sq. ft., the firebox contributing 86 sq. ft. The weight in working order was 36 tons 2 cwt., of which 24 tons 10 cwt. was carried on the coupled wheels. They were the first engines on the line to have leading bogies and six-wheeled tenders.

The new engines were immediately put to work upon the main line trains from Carnforth, where two of them were stationed. Having obtained these engines it was decided to convert some of the older 2–4–0 engines into 2–4–2 tank engines for general and branch line traffic, since the branch trains were becoming heavier than the small single tank engines could tackle. The converted engines retained the old boilers with 120 lb. pressure and 910½ sq. ft. of heating surface. New side tanks, holding 1,000 gallons of water, were added, and also a trailing coal bunker of a capacity of 32 cwt. was placed over a new radial trailing axle. The engines so converted were Nos. 47, 48, and 70 to 74. At first some of them retained the old bell-top chimneys, and the brass safety valve casings over the fireboxes, but they were subsequently reboilered, and afterwards presented the appearance shown in the

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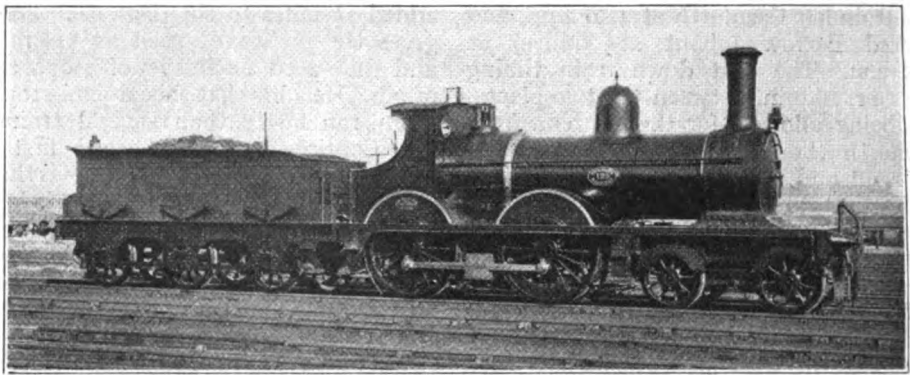

Photo.] 4-4-0 PASSENGER ENGINE, No. 123. [*Loco. Publishing Co., Ltd.*

Built by Sharp, Stewart & Co., Ltd., 1890. Coupled wheels, 5 ft. 6 in. diam. Cylinders, 17 in. by 24 in.

illustration of No. 73. The weight in working order was 44 tons 11 cwt., the adhesive weight being 26 tons 9 cwt. These engines are still at work, but of the remaining twelve 2–4–0 engines five had been scrapped by 1917.

The 2–4–2 tank engines were put to work upon the Coniston and Windermere branches, and after a time they superseded the single-wheel tanks on the Grange and Kendal service.* They also worked another service which has not been mentioned, though I do not know when it was first inaugurated. The Furness Railway has running powers over the London and North Western Railway between Carnforth and Lancaster; in fact, its connections with the Midland Railway before 1867 were worked over this route. A passenger service was at one time worked by the Furness Railway between Carnforth and Lancaster, but this was discontinued about 1895 or 1896, and in place of it they worked passenger trains between Grange and Morecambe (London and North Western Railway). For some time these trains were under the charge of the 2–4–2 tank engines, of which No. 47, stationed at Carnforth, was one, though I have often seen the old 0–6–0 goods engines, such as No. 53, on this service. Other 2–4–2 tank engines were sometimes to be seen on stopping main line trains, principally on the northern portion of the line.

By 1891 there were a few improvements in the train service, and a good many retrograde "decelerations." The old 7.30 p.m. from Whitehaven now arrived at Carnforth at 9.55 p.m., 10 min. slower than in 1880, and 3 min. to the bad as compared with 1888. The 4.40 a.m. down mail from Carnforth took 50 min. to Barrow (28½ miles), and arrived at Whitehaven at 7.5 a.m. The 12.10 p.m. ex-Carnforth ran through to Ulverston without a stop, but nevertheless, required 55 min. to reach Barrow. The best down train, the 10.18 p.m. from Carnforth, stopped at Ulverston only, and reached Barrow at 11.5 p.m., or 2 min. slower than the Midland boat train of 1888. The same timing was allowed for the 3.43 p.m. from Carnforth to Barrow, but this train gave the better timing of 2 hr. 12 min. to Whitehaven than it had previously attained. Even the up Douglas boat train to the Midland, which left Barrow (Ramsden Dock) at 12.25 p.m., required 50 min. to Carnforth in spite of the fact that it was the only train that had a non-stop run.

A new feature was a through train from Carnforth to Windermere (Lake Side), on Mondays only, which took only 39 min. for the journey. This travelled direct round the Eastern loop without going into Ulverston.

On September 22, 1892, there occurred one of the strangest accidents that ever happened on a British railway. The

* Referring to this service on page 237 of the October issue, the junction of the L. & N.W.R., south of Oxenholme, should have been printed Hincaster instead of Wincaster Junction.

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whole area in the Dalton and Lindal district is honeycombed with ironstone mines, and signs had for some months been noted that subsidences of the ground and railway were beginning to occur to an extent that caused the company to keep watchmen continuously on duty on the threatened section. On the day in question one of the standard 0-6-0 goods engines, No. 115, was shunting near Lindal, when the driver felt the ground giving way. He shut off steam, reversed his engine, and jumped off just as the engine went down head first into a large hole which suddenly made its appearance in the embankment. In about half-a-minute there was nothing to be seen of the engine but the cab and footplate. The tender did not go down owing to the breaking of the coupling, and was shortly afterwards drawn back in time to be saved. Breakdown gangs with equipment were immediately despatched, both from Carnforth and Barrow, but by the time they appeared on the scene the engine had utterly disappeared, and has never been seen since. It is estimated that it is now about 200 ft. down below the level of the railway. The original chasm increased in size rapidly, and in a short time after the engine had disappeared, extended across the embankment on which there were eight lines of rails. Most of these roads sank completely into the gap, but the main line which passed over the embankment on longitudinal sleepers, remained suspended over the chasm. It was considered that the great volume of water which had been pumped from the mines at the bottom, had caused a percolation from the upper strata just below the railway, with the result that cavities were formed which eventually gave way and caused the subsidence. The whole traffic between Barrow and Carnforth was naturally completely stopped. The goods and mineral traffic had to be sent round *via* Whitehaven, Keswick and Penrith, and thence over the London and North Western main line. For a time passengers were conveyed to one side of the damaged portion of the railway, where they left the train, walked round the gap, and re-entered another train on the other side. Even after temporary repairs had been made and the gap filled up, passengers had to leave the train, and walk across the unsafe portion followed very slowly by the empty train, which they re-entered on the other side. The train in this case did not pass over the main line, but over a siding which had been only slightly affected.

The Furness Railway was one of the first in this country to use long bogie wagons for the carriage of rails and iron ore. There are a considerable number of steel works on the line, from which rails form

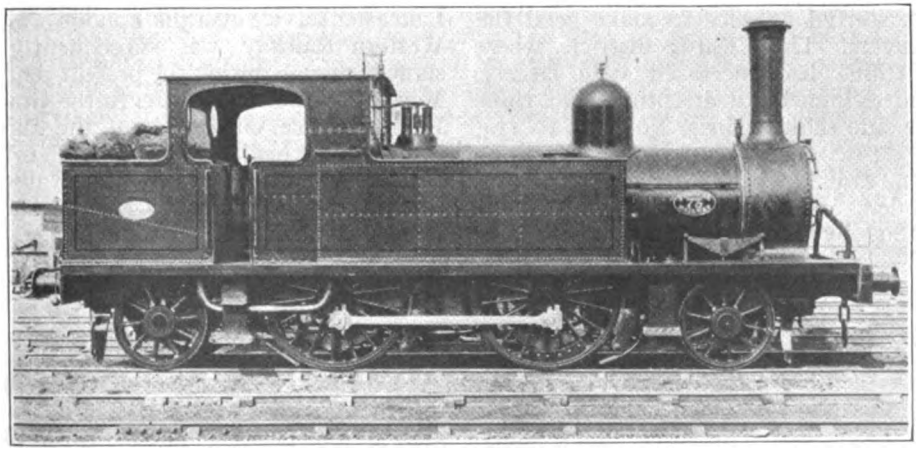

Photo.] [*Loco. Publishing Co., Ltd.*

2-4-2 PASSENGER TANK LOCOMOTIVE, No. 73.

Rebuilt from a 2-4-0 passenger tender engine. Coupled wheels, 5 ft. 6 in. diam. Cylinders, 16 in. by 20 in.

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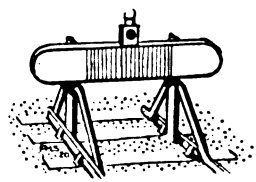
a very large proportion of the output. The ore wagons are used locally for the conveyance of the hematite from the mines to the works.

In 1896 another and a larger class of 4-4-0 engines was placed in service on the line, and again a class running on the Cambrian Railway was selected. Like all their predecessors the new engines were designed by Sharp, Stewart & Co., who had built 12 of them in 1893–4 for the Cambrian. The six new Furness engines, Nos. 21, 22 and 34 to 37, had 6-ft. coupled wheels, 18 in. by 24-in. cylinders, 150 lb. pressure, and a heating surface for the tubes of 1,109 sq. ft. plus firebox 99½ sq. ft., making a total of 1,208½ sq. ft. The weight in working order was 41 tons 6 cwt., of which the adhesive weight was 27 tons 14 cwt. Two more of these engines, Nos. 124 and 125 were built by Sharp, Stewart & Co. in 1900 during Mr. Pettigrew's superintendency. They differed in a few details of the motion and valve gear from the No. 21 class, but otherwise were of the same design, and were built to this design in order to expedite delivery. These eight engines are still doing a great deal of the main line work.

No engines for goods and mineral traffic had been put into service since 1884, when the last two of the old standard 0-6-0 engines were built, and as this class had now become too light for the heavy traffic Mr. W. F. Pettigrew, who had been appointed Chief Locomotive Engineer in 1897, started at once to make good the deficiency. The Cleator district, where the traffic had increased very largely, required immediate attention, and three 0-6-2 side tank engines, Nos. 112 to 114, with 4-ft. 8-in. coupled wheels, 3-ft. 8½-in. radial wheels, 18 in. by 26-in. cylinders, and 150 lb. pressure were built in 1898 by Sharp, Stewart & Co. The following year 12 powerful 0-6-0 goods tender engines to the same general dimensions came out, six from Sharp, Stewart & Co., and six from Nasmyth, Wilson & Co., of Patricroft. The latter six engines were the first to be built by any firm other than Sharp, Stewart & Co. since 1861.

An examination of the time-tables in 1899 shows no advance on the speeds of 1891, in fact it seems that the Furness had reached its high-water mark in 1888 with the Midland down boat train. One of the best through expresses to Whitehaven, the 1.10 p.m. from Carnforth, was due at Barrow at 2 p.m., with stops at Ulverston and Furness Abbey, and a conditional stop at Dalton. Leaving Barrow at 2.5 p.m. it reached Whitehaven at 3.30 p.m. The northern section of the line, being partly single, presents a number of difficulties which militate against the working of express trains. There was, however, a laudable desire to move over the Barrow–Carnforth section, and to this end for some years coaches had been slipped off the fastest trains at Grange, thus eliminating one stop. And if the company did not increase the speed of its trains, at least the quantity was increased and more travelling facilities were afforded. Further, in the matter of cheap excursions it was one of the premier lines in the country.

Since the above was set up in print, I have received information that the Carnforth–Lancaster service over the London & North Western Railway was subsequently resumed, though during the present century. Moreover, referring further to the Grange-Kendal service, one or two of the Furness trains were extended to run through to Windermere (London & North Western Railway). Certain of the trains to Kendal started from Arnside instead of from Grange.



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The Angus Train Control System.

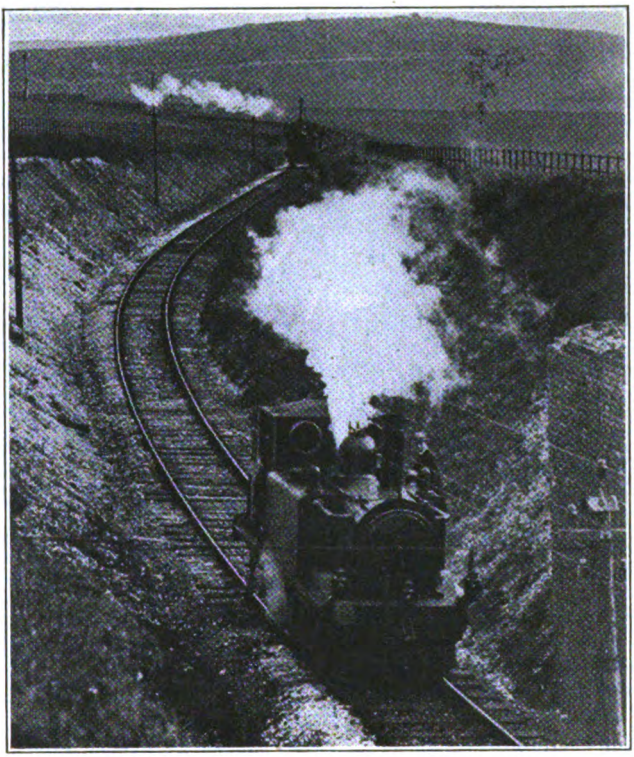

Photo.] [*Topical.*

VIEW TAKEN AT DEMONSTRATION OF ANGUS AUTOMATIC TRAIN CONTROL SYSTEM.

FOR twelve years or more Mr. A. R. Angus, an Australian engineer, has been engaged in developing a system of safeguarding and controlling railway train movements, and in 1912 and 1913 trials were conducted on a section of the West Somerset Mineral Railway, near Minehead, rented by Mr. Angus for the purpose. Trials were also inaugurated in Russia on the line from Vladimriskiya to Gatchina, and, in 1917, during the war (which precluded further developments in countries involved), in Sweden on the Osmo-Nynashamn Railway.

As soon as possible after the conclusion of the war it was decided to resume trials in England, and an arrangement was made with the London, Brighton & South Coast Railway to instal it on the Dyke branch from Hove, for testing and demonstration purposes. Here the plant has been developed in several respects, and during this year it has been inspected by Colonel Pringle, R.E., and expert members of the Train Control Committee appointed by the Ministry of Transport, by signal engineers of many of the leading railways in the United Kingdom, and by representatives in England of many of the Colonial, South American and foreign lines.

On Thursday, September 22, a further demonstration was held, at which a representative of the RAILWAY MAGAZINE was present. For trial and demonstration purposes two 0–6–0 tank engines of the "Terrier" class, Nos. 643 and 680, have been fitted, and a stretch of line from the Dyke terminus equipped. The tests, which all operated most satisfactorily, included sending one of the engines into the section next to that which was already occupied by the other, with the result that, although steaming and travelling fairly fast, as soon as the section next to the occupied section was entered, the whistle was sounded, and, no notice being taken by the driver, steam was then cut off automatically and the brakes applied.

In its earlier form ramps or track contacts were used, but now these have been dispensed with. Instead, each locomotive has two narrow casings fitted between the wheels over the rails, the lower face being parallel with, and about 2 in. above, the running rails. The essential feature is that a low-voltage alternating current of slow periodicity, usually 5 to 10 volts and five periods per second, is supplied to the track rails (provided that the section is clear), and this acts inductively first upon a relay of robust type adapted for the small currents received, which actuates a more powerful relay connected to a magnetic device, whereby the control

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Photo.] [*Topical.*

MR. A. R. ANGUS EXPLAINING THE WORKING OF THE CONTROLS ON THE LOCOMOTIVE.

valves of the steam cylinder, which operates the steam regulator and the brake valve, are prevented from acting to shut off steam and apply the brakes. This control device includes also a weight element, so that the normal tendency is always to prevent the engine from moving or to bring a train to a stand unless the track current is properly received. A failure in any respect, an obstruction on the line, or the absence of the track current for any reason, therefore tends to bring a train to a stand, or will prevent it moving should conditions not be right therefor.

In practice, the track current is controlled by track circuit—or rail contacts, as in "lock and block," can be used—and this is associated with a system of route sections. These are arranged according to the layout of the station or portion of line concerned, and, before a train is permitted to move, it is necessary for the signalman to "test" for track clearance by moving a switch for each section. Usually these switches would be associated with the signal and point levers, or there may be one for each traffic route, so that unless the track circuits or rail contacts indicate a clear road, with allowances for the possibility of fouling vehicles and the usual overlaps, the control circuit cannot be established. As a rule this is a simple matter of d.c. track circuit, and if this responds on the basis of a clear route the a.c. track current is placed on the rails and the engine is free to move as desired. If for any reason the track circuit shows track occupancy, or a rail breaks or a bond gives, it is, of course, impossible for the track current to be switched on. Similarly, should an obstruction occur after a train has started, or another train enters a conflicting section, the track circuit acts to break down the track current, thereby bringing the train to a stand.

The apparatus is of a simple character, and the slow periodicity of the track current removes almost every possibility of interference from extraneous sources, or from power circuits on adjacent conductor rails or overhead wires, or from return or signalling currents on the running rails. As mentioned, a whistle gives the driver warning that he is to pull up, and steam is not shut off and the brakes applied unless he fails to respond. When the section clears after a stop, a bell rings as an indication that the driver may proceed.

Although the system can be applied in connection with existing signals, it is contended that signals can be dispensed with, and trains may run safely at normal speeds even in dense fog, while Mr. Angus has associated with his system several special developments (including a speed control element), of which particulars cannot yet be given, in view of patent requirements, whereby (1) trains are protected against derailment at curves, an indication being given automatically on the engine when the train is at a safe distance from a curve, indicating the

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degree of the curvature ahead of the train, the safe limit of speed at which the curve may be passed by the train; (2) as the train approaches points or switches, an indication is given on the train as to whether or not the points are safe to cross (in the latter case the driver can then telephone from the locomotive to the signal-box and call attention); and (3) "a number of classes of accident which it had been declared recently by a leading technical journal relating to railways cannot be prevented by any automatic train stop apparatus, but which the Angus system will prevent," namely, (*a*) deformation of road due to spreading, sudden heat or other causes; (*b*) drivers travelling too fast round curves; (*c*) signalman's errors; (*d*) buffer stop collisions, this system being a positive continuous one so far as the movement of trains is concerned); (*e*) certain obstructions on railways; (*f*) broken rails; (*g*) errors of drivers after they have passed the distant signal; (*h*) failure of the apparatus installed; (*i*) failures of the automatic brake apparatus; and (*j*) certain other causes.

As to how far these claims are justified we are not prepared to express an opinion in default of more complete information. Meanwhile, we may express appreciation of the demonstration given by Mr. Angus and his colleagues. Among those present with Mr. Angus were the Hon. Philip Henderson, of Livesey, Son & Henderson; Major R. B. Bristed, M.I.C.E.; Mr. W. J. Thorrowgood, Signal and Telegraph Engineer, London & South Western Railway; Mr. C. W. Neele, Electrical Engineer, Great Central Railway; Mr. W. Challis, Signal Engineer, Metropolitan Railway; Mr. Lee Murray, M.I.C.E.; Colonel W. R. Howell, A.I.C.E.; Colonel L. Broome, advising Chinese Government Railways; Professor Hj. Sjogren and Captain Gyllensvard, of the Nynashamn Railway, Sweden, where the system has been tested; Colonel C. A. Barron; Lord Rotherham; General Milman; Major C. E. Anderson; Mr. Salmon, of Sir W. G. Armstrong, Whitworth & Co. Limited, and others. Arrangements are now being made for installing the "Angus" automatic safety system on several railways in due course.

BRITISH-BUILT LOCOMOTIVE FOR HOLLAND AS USED ON THE NORTHERN RAILWAY OF FRANCE.

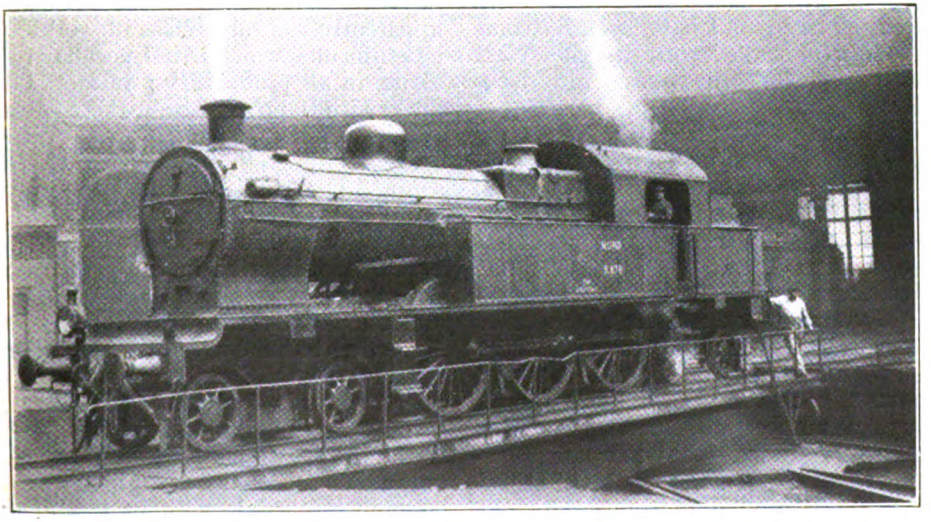

Photo.] [*W. H. C. Kelland*

4-6-4 superheater tank engine, No. 3876, built by Messrs. Beyer, Peacock & Co., Ltd., for the Netherlands State Railways, commandeered by the War Office for R.O.D. service in France during the war, and since taken over by the Northern Railway of France.

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British Locomotive Practice and Performance.

By CECIL J. ALLEN, A.M.Inst.T., A.I.Loco.E.

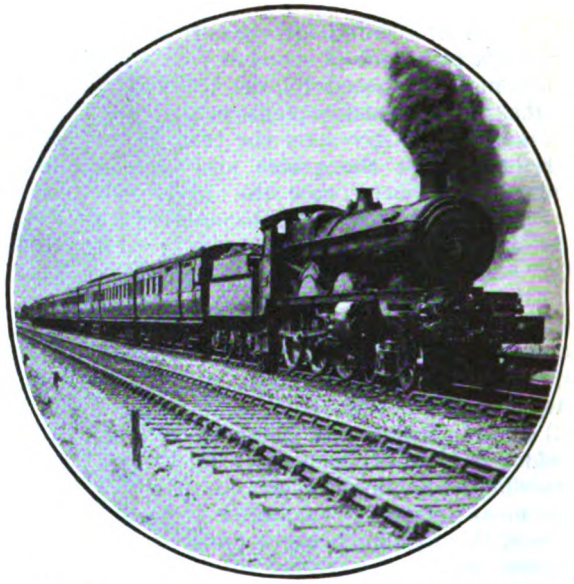

Photo.] [*Harry L. Salmon.*

GREAT WESTERN RAILWAY.

Birkenhead–Bournemouth Express (L. & S.W.R. coaches).
Four-cylinder 4-6-0 locomotive, No. 4054, "Princess Charlotte."

FROM the wilds of Western Australia a letter reaches me which adds yet one more testimony, if any were needed, to the extraordinary fascination exercised by British locomotive matters even over those who have long since passed out of intimate touch with British railways. "I have been for some years now on axe work in the West Australian bush," the writer introduces himself, "and have not been able to get the RAILWAY MAGAZINE, but a relative is now kindly sending it regularly, and the arrival by bush mail of a copy is, I can assure you, the most important event in an otherwise monotonous existence. I have just a 6-ft. by 8-ft. tent, and as company a kangaroo dog; otherwise I live and work entirely alone. But my greatest treat is to lie in my tent at night, with my pipe and the old RAILWAY MAGAZINE, each copy of which gets read through a number of times." One can imagine my friend—the comparison is really irresistible—saying to his faithful dog in the fashion immortalised by old Omar Khayyam :—

"A RAILWAY MAGAZINE beneath the bough,
A shady tent, a fragrant pipe, and thou—
O! that were paradise enow . . ."

But let me hasten from such lyrical lapses to the subject matter of my correspondent's letter.

The matter which causes him the most concern is the disparity in dimensions between different classes of locomotives in this country which are performing apparently the same class of work. This is a difficulty which is not peculiar to him alone, in all probability; in fact, I have dealt with it previously in these columns, but it will not prove a waste of time or space if we go briefly over the ground again. The subject will also prove a peculiarly suitable introduction to the locomotive performance which I had planned to describe in the present issue. Let me therefore quote the line of reasoning followed by the writer of the letter. Adverting to the series of London, Brighton and South Coast runs which I described towards the close of last year, he says: "Surely, if the Brighton 4-4-0's and 'Atlantics' can haul 240-ton trains between Victoria and Brighton on the 60-minute schedule without loss of time, the 4-6-4 tanks with their huge boilers and cylinders and ample adhesion should find no trouble with a train of 600 tons. Some time ago I read particulars in a con-

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temporary of trials with 'Pacific' engines in France"—it is evidently the Maréchal tests on the P.L.M. Railway that are referred to—"in which they were proved capable of hauling trains of 600 to 700 tons weight at maintained speeds of 60 m.p.h. and over. If that is the case, what is to prevent our latest 6-coupled express engines from doing the same class of work as the French locomotives?" The P.L.M. "Pacifics" are, of course, considerably heavier and more powerful engines than any yet built in this country, but on the basis of tonnage hauled and speed maintained in proportion to total engine weight, I should imagine that the feats performed on the Great Northern Railway during the recent coal dispute, recorded in the August and September issues by another writer and myself, would bear comparison with anything which has ever been done over the water.

The letter then goes on: "If, as described by you, a Great Northern Railway 'Atlantic,' with only 37 tons adhesion, could work a fast express of 450 tons, surely a train of the same weight should be, metaphorically speaking, a mere nothing to a London and North Western 'Claughton'; and as for a 240-ton load on the Brighton—well, No. 327 ought not to know that she has got such a thing as a train behind her at all! If an ordinary 6-coupled goods engine can haul from 600 to 700 tons, then, surely, these latest 6-coupled express engines, with their much larger cylinders, boilers and more ample adhesion weight, should be able to haul similar loads at express speeds. I know that a driving wheel of 56 to 60 in. gives greater tractive power, but it seems to me that the larger cylinders of the express engines, say, four 16-in. by 26-in., or two at 21 or 22-in. by 28-in. *plus* from 6 to 10 tons more adhesion weight should fully compensate? If not, then surely, while the dimensions of modern 6-coupled express engines are far greater than those of the 4-coupled types which immediately preceded them, on the basis of work performed, the power developed is not at all in proportion, and the 4-4-0 engines must in reality be far the more capable of the two. This I cannot believe." The remainder of my friend's letter is occupied with the relation between the number and diameter of coupled wheels and maximum attainable speeds, and he cites well-known examples to prove that coupling and relatively small diameters apparently offer no hindrance to high speed running.

And now let me attempt to throw light

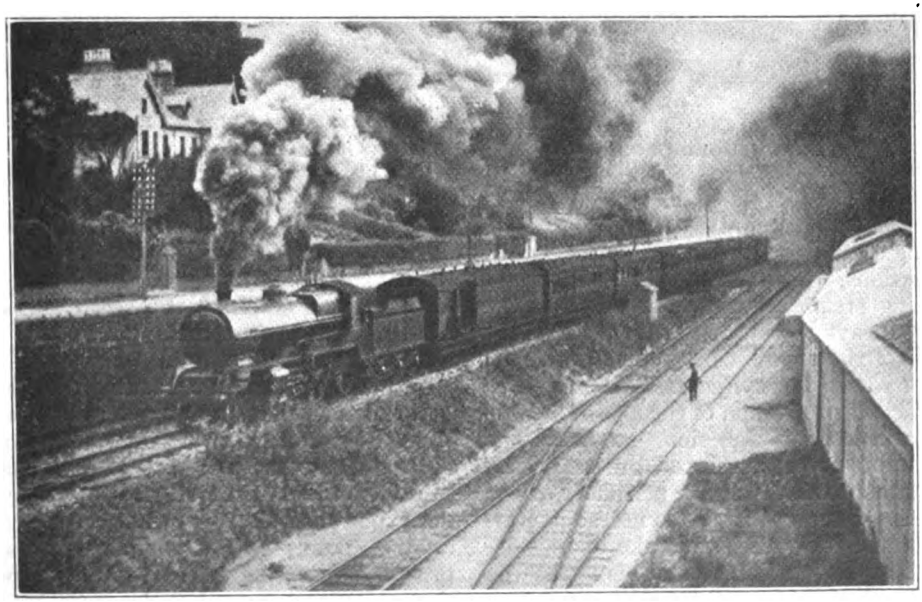

Photo.] **GREAT SOUTHERN & WESTERN RAILWAY, IRELAND.** [*R. Murphy.*

Up mail train leaving Queenstown. New four-cylinder 4-6-0 engine, No. 401

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on the writer's main difficulty. Like the correspondent with whose query I dealt in these columns some time ago—who was unable to understand the necessity for engines of such size and power as the 4-cylinder 4-6-0 "Lord Faringdon" type on the Great Central Railway—my Australian friend is basing his judgment on one only out of two controlling factors. In the first place, dimensions merely do not necessarily provide an index of the tractive capacity of the locomotive concerned. This may sound paradoxical, but is nevertheless true. For example, the well-known formula for calculating tractive force takes no account whatever of steam-raising capacity; it is founded on cylinder dimensions, driving-wheel diameter, and working steam pressure only, and, therefore, always pre-supposes both that the boiler of the engine can produce sufficient steam to fill the cylinders, and also that a sufficient proportion of the engine weight is available for adhesion, so that the maximum power developed by the cylinders can be utilised at the periphery of the wheels. But what if this is not so? Stirling made the radical mistake of increasing the cylinder diameter of his last batch of 8-ft. singles from 18 to 19½ in., without increasing his boiler dimensions; thus, the boilers were unable to find steam with sufficient rapidity, and these engines were, by comparison with their predecessors, not far short of failures.

Let us suppose, however, that we can include heating surface, grate area and adhesion weight in our tractive-force calculation; can we then arrive at a true estimate of locomotive capacity? Not necessarily. It is possible so to crowd a boiler with small tubes that the heating surface appears enormous, whereas steam is not produced with anything like proportionate rapidity. Further, in a very long boiler, the steam generated by the front end of the tubes is only a small fraction of that produced round the firebox. The fact of the matter is that there are practical elements in the design of a locomotive which cannot be reduced to figures or formulæ, and yet have the strongest possible influence on the performance of that engine on the road. However, we are on safe ground in conceding the possibility of designing on any one railway two types of engine in succession, the second of which, calculated by the ordinary tractive force formula, is, say, 30 per cent. more powerful than the first, and whose relative powers of haulage are actually proved under test to be in this proportion. Suppose then that the more powerful type is arranged to work precisely the same trains as the less powerful previously, without any alteration in schedules

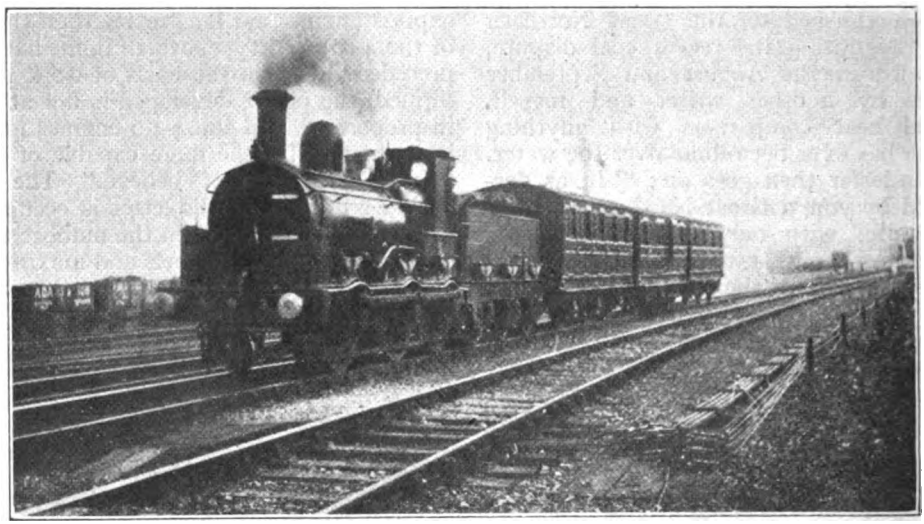
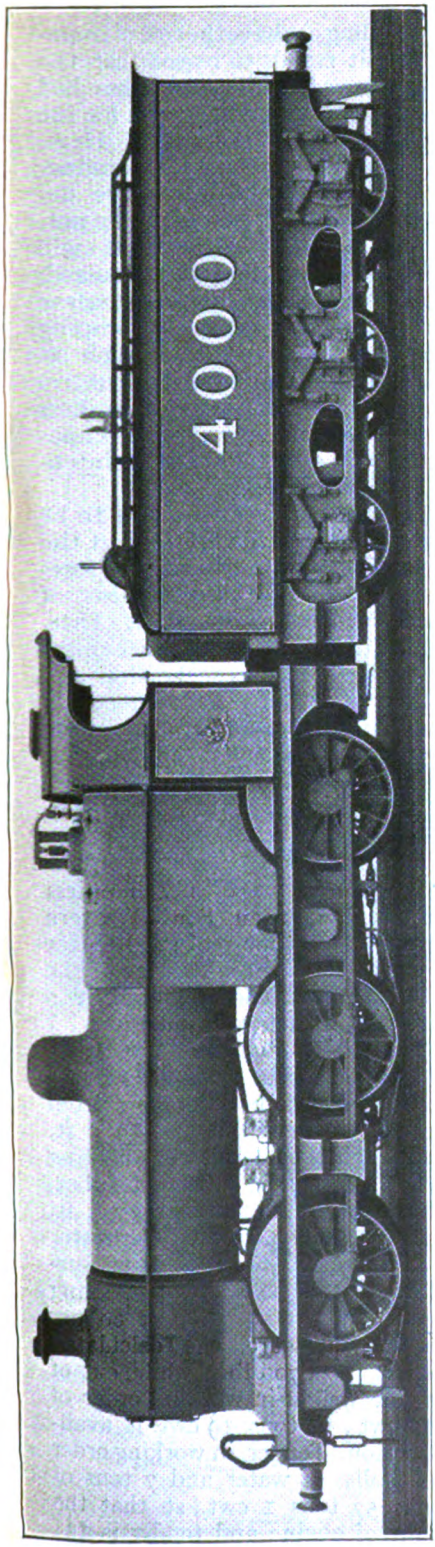


Photo.] [*J. Macartney Robbins.*

STRATFORD-UPON-AVON AND MIDLAND JUNCTION RAILWAY.

Towcester train leaving Blisworth. 0-6-0 engine, No. 3.



NEW SUPERHEATER GOODS LOCOMOTIVE, No. 4000, MIDLAND RAILWAY.

This engine initiates numbers from 4000 onwards. It is generally similar to the earlier superheater goods engines designed by Sir Henry Fowler, K.B.E., except that screw reversing gear is fitted instead of steam mechanism, and superheater dampers and control gear therefor are dispensed with.

or loadings, and I think that this hypothesis, which is fairly well representative of present-day conditions, is one parallel to my friend's line of thought. What, in brief, is the object of designing and building the more powerful engine?

Here the second controlling factor comes in. It is that of the expenses of fuelling and maintenance. As I have so often remarked in these columns previously, the recorder of locomotive running who confines his observations to the interior of a compartment secures what is, to all intents and purposes, a partial record only. He notes, perhaps, that the small 4-4-0 and the large 4-6-0 have on different occasions made precisely the same times under similar conditions of loading and weather. But he knows little or nothing of what has taken place on the footplate during each journey—of the amount of coal that has been burnt, or of the position of regulator and reversing gear, as an indication of the hardness with which the engine has been worked. I daresay many readers have little or no conception—very likely they have never given the matter serious thought—of the differences that exist in footplate conditions as between trip and trip. Only the other night the driver of a 4-6-0 engine on a heavy boat express of one of our leading railways told me that the maintenance of this particular schedule cost his engine a coal consumption of some 65 lb. per mile, whereas an increase of 5 min. in the booking—a mere 6 per cent.—would probably reduce that consumption by 25 per cent. And he was a reliable witness.

This is merely an illustration as to how a slight increase in the relative difficulty of locomotive work increases out of all proportion the consumption of fuel, and readers hardly need reminding of the serious influence that such an increase may have on running costs at a time like the present, when the value of coal is so enormously above its pre-war level. Conversely, when a well-designed locomotive is running well within its tractive capacity, the coal consumption is on a proportionately low level. *Pari passu* with

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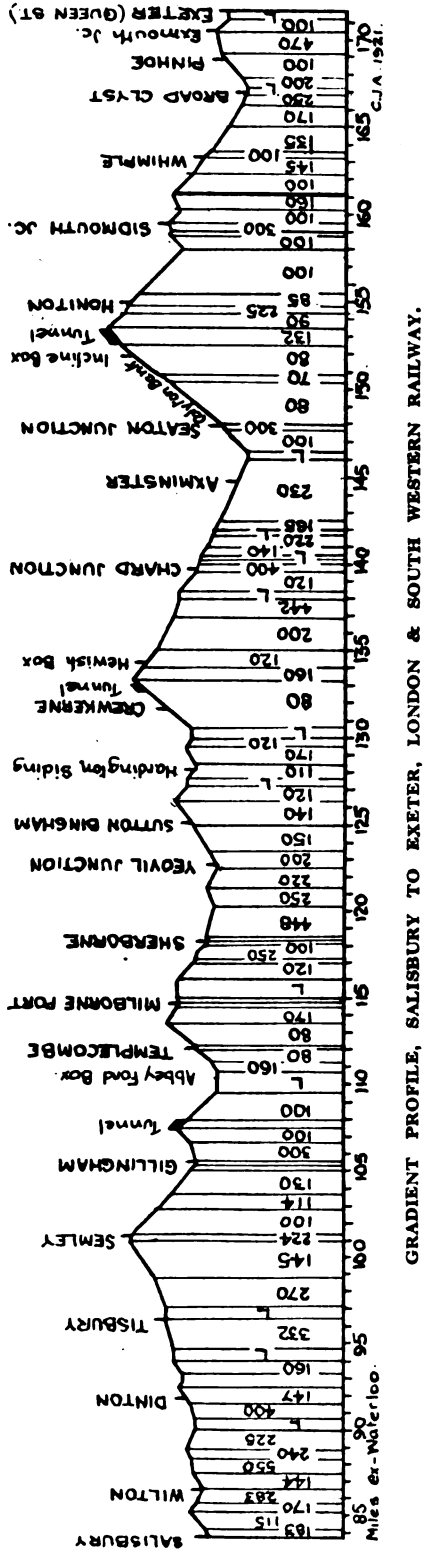

the cost of fuelling, we have the cost of maintenance, and it stands to reason that the engine which never requires to be thrashed is the one which is going to remain for the longest period out of the shops. Here, then, we have the secret of the paradox. The whole object of the locomotive designer of to-day is not, emphatically not, to build the smallest engine that will succeed in performing the work required, but rather an engine with an ample reserve of power—an engine capable of coping with exceptional circumstances, such as those of a coal strike period, when required; an engine which, in general, is working well within its maximum capabilities, and whose fuelling and maintenance bill is correspondingly small.

It would hardly be possible for me to be more favourably situated than I am at the present moment for illustrating the foregoing remarks, as by the kindness of Sir Herbert Walker and Mr. R. W. Urie, General Manager and Chief Mechanical Engineer respectively of the London and South Western Railway, I have recently been afforded an opportunity of making a further series of footplate journeys on the latter's fine 4-6-0 engines of the "736" class. Curiously enough, my Australian friend's letter commenced with a reference to these locomotives. "As a boy," he writes, "I spent some of my happiest hours along the London and South Western Railway, and it does me real good to see them coming to the front with some of the most powerful express engines. Could you kindly let me know their full dimensions?"

With pleasure. Cylinders are 22-in. diameter by 28-in. stroke; coupled wheels, 6-ft. 7-in. diameter; boiler tapers from 5-ft. diameter at the front end to 5 ft. 4⅜ in. at the firebox end, and has a heating surface of 1,252 sq. ft. in small tubes, 464 sq. ft. in large-flue tubes, 162 sq. ft. in firebox, and 308 sq. ft. in superheater tubes, totalling 2,186 sq. ft. heating surface; grate area is 30 sq. ft.; working pressure, 180 lb. per sq. in.; at 80 per cent. working pressure, the calculated tractive effort is 24,700 lb.; while, out of a total engine weight in working order of 77 tons, 17 cwt., 55 tons, 19 cwt. is available for adhesion. Tender, in working order with 5,000 galls. of water and 7 tons of coal, weighs 57 tons 1 cwt., so that the total weight of engine and tender is 134

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tons 18 cwt.; over buffers the total length is 66 ft. 5¼ in.

My most notable trips were made with our old friend Driver C. Clarke, of Salisbury, and it was once again the greatest pleasure to me to see at close quarters that happy combination — a driver who is master of his engine, and an engine that is master of its work. It was over one of the hardest of British express routes—the heavy section between Salisbury and Exeter—that these journeys were made, and to aid the reader in his appreciation of the work performed, a profile of the route is furnished. At the same time, an extent of over 75 per cent. slack or fine dust. Its properties of facial discolouration I learned to my cost when subsequently undertaking the painful task of once again rendering myself a recognisable member of society! After getting away from Salisbury, we went up the rising grades to Semley on a cut-off mostly at 35–37½ per cent., with regulator full open; an increase was made to 40 per cent. on the final pitch at 1 in 145, on which we fell to exactly 40 m.p.h. The most moderate downhill speeds followed, at no point exceeding 70 m.p.h.; in fact on this, as on all steep descents, Driver

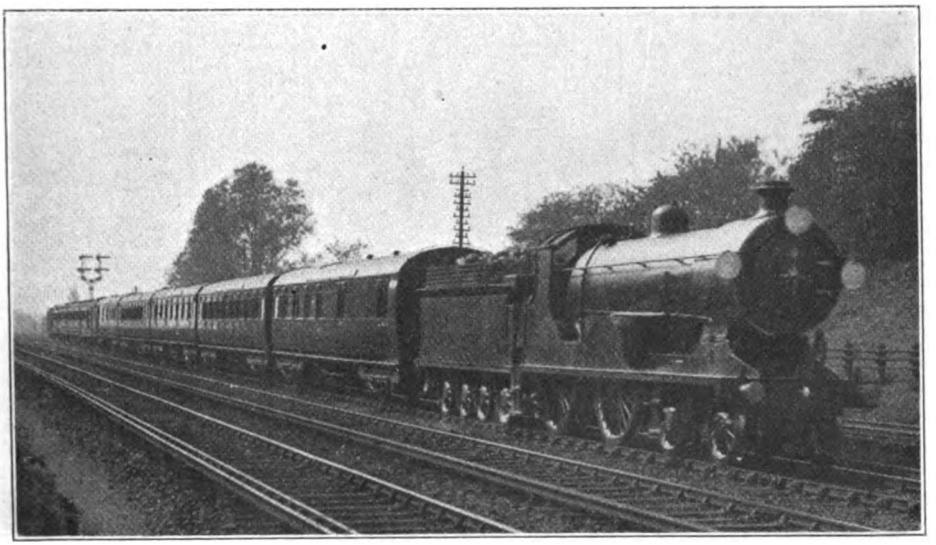

Photo.] LONDON & SOUTH WESTERN RAILWAY. [*F. E. Mackay.*

Superheater 4-4-0 locomotive, No. 469, on Bournemouth Express. New corridor and tea-car rolling-stock.

to economise space, and also to ensure that no detail of the running be overlooked, I have tabulated the four journeys. We will now go over them in detail.

The first trip was made on what is usually the heaviest train of the day—the 11 a.m. Ilfracombe express from Waterloo—but on this occasion it was unfortunately running in duplicate, so that out of Salisbury our load did not exceed ten bogies. There was a strong south-westerly wind, with occasional drizzle; but a worse hindrance was a tender full of foreign coal (this was immediately after the conclusion of the coal dispute), which was to Clarke made constant slight applications of the brake in order to steady the train. Templecombe bank was ascended at a minimum again of precisely 40, with a 40 per cent. cut-off; we then reached 74 m.p.h. on the descent to Sherborne. Sutton Bingham bank was "rushed" at a minimum of 44½ m.p.h., on a cut-off of 35 per cent.; but the steeper 1 in 80 pitch past Crewkerne, taken at 40 per cent., reduced the rate to 33 m.p.h. Once again, on the "racing" stretch from Hewish down to Axminster, speeds were restrained, as we did not exceed 74 m.p.h., and ran for the most part at about 71–72; but

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our anticipations of catching up the first division of the train were well founded and materialised in a dead stand for signals at Seaton Junction.

We could not have stopped at a worse place, as we now had to get away from rest on the 4½ miles of 1 in 80 and steeper, which constitute the redoubtable Colyton bank—not to mention the subsequent mile at 1 in 132 through Honiton Tunnel. But the work of the engine here was remarkable. With regulator full open, and gear notched up to 55 per cent., No. 743 accelerated almost all the way up the bank, passing mile-post 149 at 26·5 m.p.h., Descending past Sidmouth Junction, our top speed was again only 72½ m.p.h.; finally, signal checks and stops from Exmouth Junction onwards spoiled the conclusion of the run, but I estimate the net time at about 101½ min.

The next journey was, for the engine, a supremely easy one, on the more lightly-loaded Portsmouth-Plymouth "diner." On this and subsequent trips the coal was of much better quality—about three-quarters lump and one-quarter slack of good calorific power. We left Salisbury nearly 8 min. late, but were ½ min. early at Exeter, by virtue of 2¼ min.

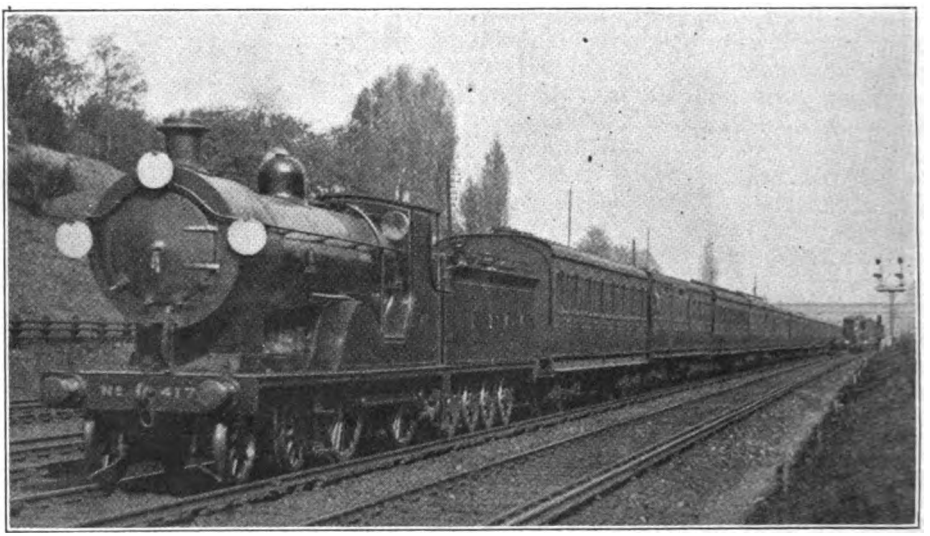

Photo.] LONDON & SOUTH WESTERN RAILWAY [*F. E. Mackay.*

Superheater 4-4-0 engine, No. 417, on down Bournemouth express.

150 at 28·0, 151 at 27·3 (the short strip at 1 in 70 was, of course, responsible for this slight drop), 152 at 27·3 and 152½, at the mouth of the tunnel, at 27·6 m.p.h. Calculating out as carefully as possible, according to the formulæ given in my article of last month, the horse-power exerted by the engine on this climb, I make it 1,160—a fine achievement, seeing that no greater percentage of cut-off was being employed than 55. Another noteworthy feat was that of Fireman Searle in maintaining in full the steam supply with such poor fuel as that available; the only drop in pressure was from 180 to 170 lb. before the summit was reached. saved at Templecombe, and good running elsewhere on the part of the locomotive; for all that, our maximum speeds after Templecombe were lower than those of the preceding journey, and a cut-off of 35 per cent. was never exceeded throughout the trip, except on starting and on the upper part of Colyton bank, where Driver Clarke opened out to 40 per cent. We touched 57½ m.p.h. at Dinton, topped Semley at 42½, and reached 72½ m.p.h. before stopping at Templecombe, to which point we had gained 70 sec. on schedule. From the dead start up the 1 in 80 of Templecombe bank we accelerated on 35 per cent. cut-off to 27½ m.p.h.; after

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that our maxima were 72½ m.p.h. at Sherborne and 71½ only at Axminster, with an intervening minimum of 34½ m.p.h. up Crewkerne bank. Colyton bank was taken in great style; at mile-post 150 we were doing 36·9 m.p.h.; at 151, 35·2; m.p.h. before Sidmouth Junction, and 71½ afterwards, we ran into Exeter ¼ min. early, having, despite the easy character of the running, gained 4¾ min. from Templecombe. With high-speed running downhill of the kind common before the

LONDON AND SOUTH WESTERN RAILWAY. SALISBURY—EXETER.

4-6-0 ENGINE No. 743. DRIVER C. CLARKE. FIREMAN S. SEARLE (SALISBURY SHED).

12.41 p.m.	12 noon.	Distances	Train	Distances	12.35 p.m.	4.30 p.m.
40	32	(DOWN)	Load (axles)	(UP)	40	38
283	217		,, (tons tare)		277	257
305	230		,, (tons gross)		300	275
m. s.	m. s.	miles.		miles.	m. s.	m. s.
0.00	0.00	0.0	Salisbury	88.0	104.10	35.45
6.10	5.35	2.5	Wilton	85.5	100.40	32.00
13.30	12.25	8.2	Dinton	79.8	93.55	24.35
					p.w.r.	p.w.r.
19.00	17.30	12.5	Tisbury	75.5	89.30	20.15
25.50	24.00	17.6	Semley	70.4	84.00	14.40
29.50	27.50	21.7	Gillingham	66.3	78.35	9.10
Pass	34.50	28.4	Templecombe	—	Pass	0.00
36.30	0.00	—		59.6	71.35	11.15
38.30	4.35	29.7	Mile-post 113½	58.3	69.55	9.05
39.40	6.00	30.8	Milborne Port	57.2	68.40	7.50
Pass	Pass	34.5	Sherborne	—	Pass	0.00
43.10	10.00	—		53.5	63.30	8.10
Pass	Pass	39.1	Yeovil Junction	—	Pass	0.00
47.15	14.00	—		48.9	58.50	61.30
49.30	16.20	41.3	Sutton Bingham	46.7	56.50	58.30
51.20	18.10	42.5	Mile-post 126½	45.5	55.35	57.05
56.35	23.35	47.9	Crewkerne	40.1	50.45	52.05
59.25	26.25	49.5	Mile-post 133½	38.5	48.45	50.00
66.00	32.55	55.9	Chard Junction	32.1	40.40	42.10
70.15	37.25	61.0	Axminster	27.0	35.00	36.35
74.00	Pass	64.3	Seaton Junction	—	Pass	Pass
74.35	40.55	—		23.7	32.10	33.40
80.25	43.25	66.2	Mile-post 150	—	—	—
82.40	45.05	67.2	,, 151	—	—	—
84.55	46.50	68.2	,, 152	—	—	—
86.00	47.45	68.7	,, 152½	—	—	—
87.55	49.35	69.7	,, 153½	18.3	26.20	27.30
89.30	51.05	71.2	Honiton	16.8	24.10	25.20
93.35	55.25	75.8	Sidmouth Junction ..	12.2	17.55	19.05
97.00	59.00	79.5	Whimple	8.5	12.20	12.30
						Sigs.
100.05	62.15	83.2	Broad Clyst	4.8	8.00	8.00
102.00	64.00	85.1	Pinhoe	2.9	6.15	6.10
Sigs.						
105.00	66.00	86.9	Exmouth Junction ..	1.1	3.35	3.30
Sigs.	68.20	88.0	Exeter	0.0	0.00	0.00
104	109	Aggregate schedule times (min.)		.. ..	104	118
101½	103½	,, net running times (min.)		.. ..	102	112½

at 152, 33·3; and at 152½, 32·9, which was the absolute minimum. On the basis of the last-mentioned figure, horse-power works out at 1,220, but as the speed was still slightly falling, it was probably about 1,200, or just under. Not exceeding 70½ war—of which this engine is fully capable, were it deemed desirable or necessary—it would have been possible to cut this time of 68 min. 20 sec. by 5 or 6 min. without difficulty, to a figure well below pre-war bookings.

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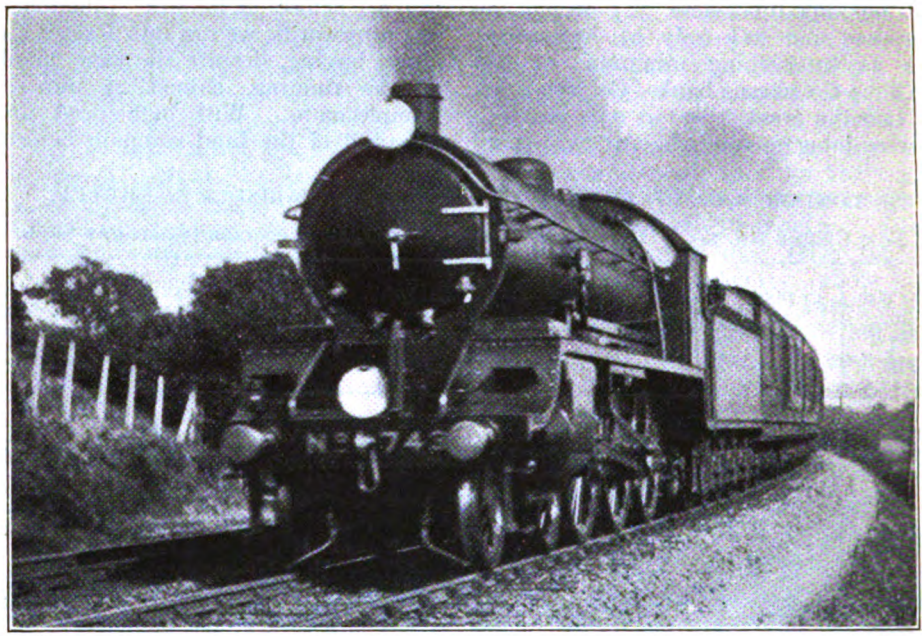

Photo.] LONDON & SOUTH WESTERN RAILWAY. [*St. J. M. Turner.*

West of England express ascending Colyton bank. Superheater 4-6-0 locomotive, No. 743.

In the up direction I was again unfortunate in choosing the Ilfracombe train on a day of division, No. 743 being retained at Exeter in order to work the second portion, which was the heavier of the two, though it totalled 10 bogie vehicles only. It was, therefore, necessary once more to run moderately, in order not to overtake the first train. The nominal booking of our second division was 109 min., but we completed the run easily in 10 sec. over 104 min.—the standard non-stop time—or 102 min. net, allowing for the bad p.w.r. check at Dinton. We were doing 64½ m.p.h. at Broad Clyst, fell to 34 beyond Whimple, and, after a brief increase to 57½ m.p.h. beyond Honiton, the minimum at the mouth of the tunnel was 32 m.p.h.; the ascent on this side is, of course, much easier than that for west-bound trains, and both of its two stages were completed on 35 per cent. cut-off. Descending Colyton bank we touched, momentarily, the highest speed attained on these journeys—77½ m.p.h.—although the speed ruled mostly round 74 m.p.h. The long climb to Hewish was made almost entirely on 30–35 per cent. cut-off, save for a short final length run at 40, minimum speed at mile-post 133¼ being a steady 41 m.p.h. After that, 35 per cent. cut-off was the highest employed at any point on this difficult route; at this figure our minimum speeds were 33½ m.p.h. at mile-post 115, and the same exactly at Semley, while maxima were 74 m.p.h. at Crewkerne, 67 before Yeovil Junction (where speed was slightly reduced), 71½ at Templecombe, and 67 beyond Tisbury. It struck me as a remarkable revolution in London and South Western Railway practice that, with a 10-coach train, No. 743 was able to run from Exeter to Salisbury, on a cut-off only once exceeding 35 per cent., in a net time within 4 min. of the crack east-bound time of pre-war days, and that despite lower average speeds downhill to a degree which would probably account for this small difference in time.

The final trip was one on the 4·30 p.m. up express, calling at Yeovil Junction, Sherborne and Templecombe, and conveying a fair load. Save for the signal check at Whimple, costing 1¼ min., the

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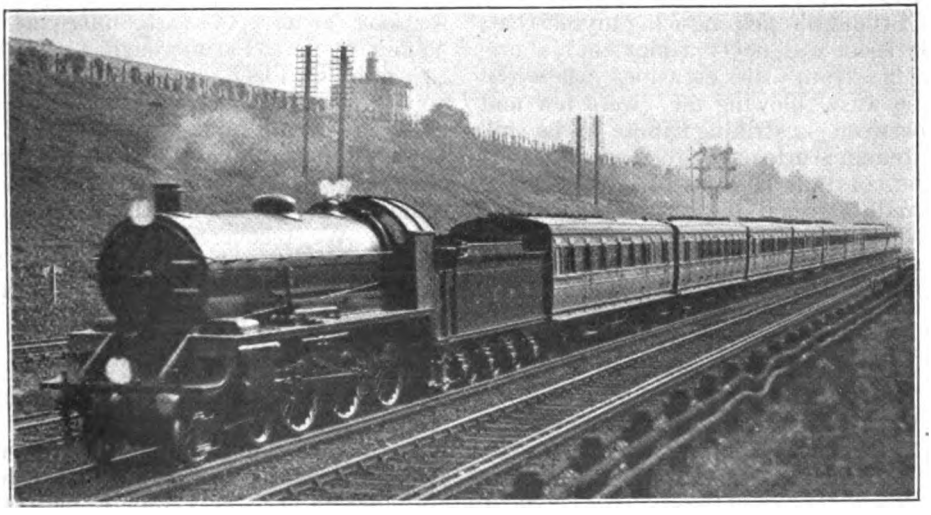
start corresponded closely with that of the previous run, with maxima of 64½ m.p.h. at Broad Clyst and 57 beyond Sidmouth Junction, and a minimum of 30½ m.p.h. beyond Honiton. Descending Colyton bank, we touched 74 m.p.h. for a moment, but mostly kept at 68–69 m.p.h.; the minimum at Hewish was 40 m.p.h., and the maximum at Crewkerne 68. So we gained ½ min, or 1¾ min. net, from Exeter to Yeovil Junction. The next short stage to Sherborne was run practically in schedule time. From Sherborne to Templecombe, with a stiff rise for 2 miles at 1 in 100–120 from the dead start, the time of 12 min. allowed is a difficult one, but by getting away up the bank on a 55 per cent. cut-off, and subsequently notching up to 40 per cent., Driver Clarke improved on it by ¾ min. The speed finally attained on the 1 in 120 was 29 m.p.h. After the fresh start at Templecombe we touched 54 m.p.h. at Abbey Ford, went up to Semley at a minimum speed of 33½ m.p.h. (on 35 per cent.), and reached 64½ m.p.h. at Tisbury before making the Dinton slack. Our net time from Templecombe to Salisbury was 33½ min.—a further improvement of 2½ min. on schedule, making 5 min. in all for the trip.

So much for the runs; now for the application of the moral. It was possible in the old days for the 4-4-0 engines largely employed on these trains to maintain the same end-to-end times with comparable loads. But the engines were being worked very hard, which meant a greater consumption of fuel; the uphill speeds were lower, which involved much higher downhill speeds in order to keep time, and thereby increased the wear-and-tear of rolling-stock and track; and the absence of any reserve of power was such as to render timekeeping almost impossible in cases of overload or bad weather. And now look at the difference! I am permitted by Mr. Urie to mention, in regard to coal consumption, that No. 743's average figure since construction, exclusively under Driver Clarke and Fireman Searle, has been 33·15 lb. per mile—an extraordinary record, in view both of the quality of coal in use since the war, and the nature of the route traversed (No. 743 works mainly between Salisbury and Exeter). For at least four months of this period the average was not over 30 lb., and one month—that ending September 12, 1920—the figure was actually 29·2 lb. And it is most important to note that these averages, small as they are, include all the coal used in lighting up and while standing, which makes the record the more surprising. In regard to wear and tear,



[Photo.] LONDON & SOUTH WESTERN RAILWAY. [F. E. Mackay.

Up Padstow restaurant car express. Superheater 4-6-0 locomotive, No. 738.

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No. 743 had, at the time I made these runs, completed two years' continuous running without heavy repairs of any kind, and a total mileage during that period of almost exactly 70,000; while it is quite evident that there has not been the slightest deterioration in the quality of the work since last I wrote of the same engine in March, 1920. Lastly, as regards reserve of power, the fact that with one or two exceptions it was never necessary to increase the engine cut-off over 35–40 per cent. proves clearly that the margin is considerable, and renders readily understandable the fact, mentioned by Driver Clarke, that he has worked loads up to 14, 15 and even 16 bogies over this road without loss of time. It is fairly certain that no other London and South Western locomotive class could show a comparable record.

This is a view fully shared by the drivers of these ten engines; Driver Clarke's own words to this effect are: "The daily repairs to this class of engine are practically *nil*, and my experience has been that, with fair quality coal, proper firing and good handling, they are the best for heavy main line work we have ever had." The "proper firing" and "good handling" are clearly evident in this particular case, seeing that No. 743's average coal consumption has been something like 5 lb. less per mile than the other engines of the 736 class. And I could not help noticing myself that, while there was never a moment's shortness of steam, the occasions when the engine was "blowing off" were few and far between—a striking tribute to the skill of Fireman Searle over a road where, owing to the constant changes of gradient, the demands on steam supply are so constantly varying. Driver Clarke also speaks highly of his hot-water injectors; with correct adjustment of exhaust cock to the tender and of injector itself, the latter can be maintained in practically continuous working on a fast run, ensuring a constant flow of hot water to the boiler, which is of great assistance in maintaining the steam pressure. The foregoing particulars should make it quite clear to my Australian friend that it is the *ultimate* economy of the big express engine that gives it so powerful an advantage over its smaller predecessors.

I have had another very interesting trip with Driver Harding and Fireman Freak, of Bournemouth shed, on No. 417, one of the rebuilt and superheated 4-4-0's of the penultimate Drummond batch. The train concerned was the 2.30 p.m. down 2¼-hour express, consisting of a new 5-coach "tea-car" set weighing 171 tons, and 5 non-corridor 8's weighing 118 tons in rear—total 289 tons tare and 310 tons with passengers and luggage. The start from Waterloo was one of the most rapid I have made for very many years, as we were through Clapham Junction, 3·9 miles, in 7 min. 20 sec.; Wimbledon, 7·3 miles, in 11¼ min.; Surbiton, 12·1 miles, in 16 min. 5 sec.; Weybridge, 19·2 miles, in 22 min. 50 sec.; and Woking, 24·4 miles, in 27 min. 50 sec. To cover the 20·5 miles from Clapham Junction to Woking with 310 tons in "even time" was a remarkable feat for an engine of this class, as it includes 8¼ adverse miles (6½ at 1 in 339–388), and only 2½ miles of corresponding descent to "balance," the remainder being level. We sustained 61 m.p.h. on the Raynes Park "level," 64½ from Surbiton to Esher, while a minimum of 57 m.p.h. before Weybridge was succeeded by a maximum of 65 at Byfleet Junction. Most unfortunately, a mishap to the automatic signals caused us to be turned "slow road" from Brookwood to Farnborough, causing bad cross-over slacks at both places; consequently, we took 36 min. 55 sec. to mile-post 31; 39 min. 55 sec. to Farnborough, 33·3 miles; 44¾ min. to Fleet, 36·6 miles; 50 min. 50 sec. to Hook, 42·3 miles; and 56 min. 20 sec. to Basingstoke, 47·9 miles. Even so, we were practically on schedule time here, whereas our net time to this point could not have been more than 53¼ min. at most. We recovered to 57 m.p.h. at Winchfield, fell to 55 at Hook, touched 61 near Barton Mill, passed Worting (50·4 miles) in 59 min. 10 sec., at 49½ m.p.h., and Litchfield, 56·2 miles, in 66 min. exactly, the lowest speed on the 5½ miles at 1 in 249 having been 45½ m.p.h.

With a shade over 23 miles left down to Southampton, and 26 min. in which to cover them, the rest was a matter of perfect simplicity. We never so much as exceeded 66 m.p.h., and twice eased to under 60, but for all that passed Winchester, 66·7 miles, in 75¾ min.; East-

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leigh (where we slacked to 45 m.p.h.), 73·6 miles, in 82 min. 40 sec., and then, after a very careful negotiation of Northam curve, we stopped at Southampton West, 79·6 miles, in 91 min. 10 sec., or 88 min. net, although allowed 92 min. The subsequent 36-min. booking for the 28·7 miles on to Bournemouth Central was observed with equal facility; we passed Totton, 3·3 miles (easing through Millbrook), in 6 min. 35 sec.; Beaulieu Road, 8·8 miles, in 13 min. 35 sec.; Brockenhurst, 13·5 miles, in 18 min. 5 sec.; New Milton, 19·3 miles, in 24 min. 5 sec.; Christchurch (at reduced speed), 25 miles, in 29 min. 20 sec., and reached Bournemouth in 35 min. 20 sec. Maximum speeds were 65 m.p.h. at Brockenhurst and 71½ down Hinton Admiral bank, while the minimum at Sway was 53. Aggregate running times from London to Bournemouth were, therefore, 126½ min. against a booking of 128 min.; net running times were 123¼ min., or, allowing for starting and stopping at Southampton, the net non-stop equivalent was about 122 min., or a shade less. With average pre-war speed down from Litchfield to St. Denis this could have been cut to 119½ or even 119 min.—that is, below the pre-war 2-hours standard for this 108-mile run. Here again, with a load some 40 per cent. at least above the average loading of the 2-hour trains, the engine was driven and fired with such consummate skill that, although considerably smaller than No. 743, time was well in hand and there was always an ample supply of steam; so well within capacity was No. 417 working, indeed, that it was not necessary to take any water at Southampton.

MIDLAND RAILWAY.
Kettering–St. Pancras train, near Mill Hill,
4-4-0 rebuilt superheater locomotive, No. 555.

Owing to lack of space, I must hurry over my remaining journeys, together with some of which I have received details from correspondents. My best trip as a "passenger" was behind the large Drummond 4-4-0 No. 464, now superheated, when the driver was Joy, of Nine Elms. The train was the 10 a.m. down Padstow, loaded to 11 eight-wheelers weighing 286 tons empty and 300 tons full. We made a good start, although not equal to that of No. 417; Clapham was passed in 7 min. 10 sec., Wimbledon in 11 min. 20 sec.,

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Surbiton in 16 min. 35 sec., and Weybridge in 23 min. 55 sec., but we were then brought almost to a stand at Woking owing to a laggard "local" crossing from the Guildford line. So we took 29½ min. to Woking, 40 min. to mile-post 31 (we accelerated from the slack up 1 in 326-314-298 to this point to exactly 45 m.p.h.), 42 min. 40 sec. to Farnborough, 52 min. to Fleet, 56 min. to Hook, 58 min. 5 sec. (55 min. net) to Basingstoke, and 61¼ min. to Worting Junction. Our highest speeds before Woking were 61 m.p.h. at Esher and 62½ at Byfleet, then 60 near Fleet and 59 after Hook, while the minimum at Battledown was 44½ m.p.h. We got up to 67 m.p.h. after Hurstbourne and 69 at Andover; fell to exactly 40 on Grateley bank, and touched 70½ beyond Porton; so we passed Oakley, 52·5 miles, in 64 min.; Whitchurch, 59·3 miles, in 71 min. 10 sec.; Andover, 66·7 miles, in 77 min. 50 sec.; Grateley, 72·8 miles, in 84 min. 50 sec.; and Porton, 78·3 miles, in 91 min. 10 sec. Salisbury, 83·8 miles, was reached in 97 min. 10 sec., or 94 min. net, the allowance being 95 min. A little more briskness downhill might have enabled us to pick up the arrears, but there was a nasty south-west wind blowing, which made itself felt considerably on exposed stretches of the line.

The oil-fired 4-6-0 No. 739 gave me rather a poor run on the 11 a.m. down, with a 12-coach train of 365 tons in all, although there was quite a violent south-west wind on this occasion; we took 7¾ min. to Clapham Junction, 18¾ min. to Surbiton, 32 min. 35 sec. to Woking, 41 min. to mile-post 31, 59 min. 50 sec. to Basingstoke, 73 min. 25 sec. to Whitchurch, 80 min. 10 sec. to Andover, 87 min. 10 sec. to Grateley, and 99½ min. to Salisbury—a clear loss of 4½ min. We never went above 57½ m.p.h. at Weybridge, fell to 45½ at mile-post 31, did not exceed 56½ between Farnborough and Basingstoke, and fell to 45 at Battledown; while the maxima at Andover and Porton were 70½ and 72½ m.p.h. respectively, with an intervening minimum of 41 m.p.h. This was not a brilliant performance.

Lastly, I have for comparison three up runs on the new timings from Bournemouth, one of my own record behind rebuilt 6-ft. 7-in. 4-6-0 No. 446, and the other two, timed by correspondents, behind large Drummond superheated 4-4-0 No. 466, and Urie 4-6-0 No. 736; loads were 10, 9, and 11 corridor "eights" (including dining car in each case), or 295, 265 and 320 tons gross load, respectively. From Bournemouth the passing times were 6 min. 55, 56 and 30 sec. to Christchurch; 14 min. 25 sec., 15 min. 18 sec. and 14¼ min. to New Milton; and 20 min. 50 sec.

GREAT WESTERN RAILWAY.

Up South Wales express near Purley (Berks).
4-6-0 Locomotive, No. 4003, "Lode Star."

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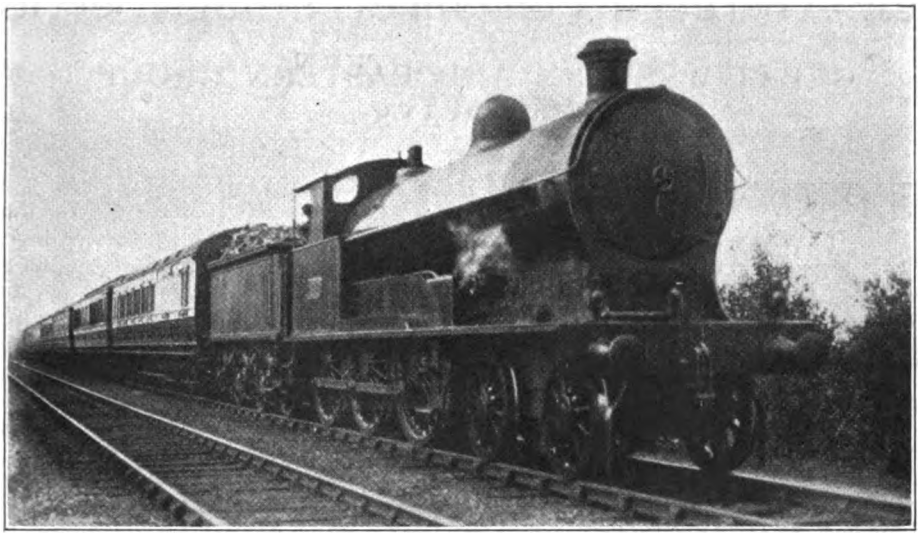

Photo]. LONDON & NORTH WESTERN RAILWAY. [*W. H. C. Kelland.*

Wolverhampton-Euston express passing Blisworth.
4-6-0 Superheater Locomotive No. 863.

to Brockenhurst in the last case only, the two former trains stopping there in 21 min. 30 sec. and 23 min. 14 sec. respectively, allowed 22 min. No. 736 passed Totton in 31 min. 25 sec., and reached Southampton in 36 min. 40 sec., allowed 38 min. From Brockenhurst, Nos. 446 and 466 passed Totton in 14 min. 25 sec. and 15 min. 19 sec., slacked over Redbridge Viaduct, and reached Southampton in 20 min. 25 and 32 sec., allowed 20 min. No. 446 had mounted Hinton bank at a minimum of 41 m.p.h., whereas No. 466 fell to 30.

Out of Southampton the long climb to Litchfield Tunnel—it averages 1 in 250 for 16½ miles—furnishes a test of strength for the engines of up trains, and is now followed by the standard timing of 42 min. for the 44 miles from Basingstoke to Clapham, which allows little margin for the recovery of lost time. The three engines passed Eastleigh, 5·7 miles, in 9 min. 55 sec., 10 min. 7 sec. and 10 min. 20 sec.; Winchester, 12·6 miles, in 19 min. 5, 31 and 40 sec.; and Litchfield Box, 23·1 miles, in 34 min. 45, 27 and 10 sec. It is curious to note how the best starter became the worst climber; No. 446 had touched 49 m.p.h. at Eastleigh, but fell to 37 at Litchfield, whereas No. 466's minimum was 40 m.p.h. exactly. Worting Junction, 28·9 miles, was passed in 42 min. 20 sec. and 41 min. 26 and 10 sec.; and Basingstoke, 31·4 miles, in 45 min., 43¾ min. and 43 min. 25 sec. For the 23·5 miles from Basingstoke to Woking, allowed 22 min., the times were 22 min. 10, 0 and 15 sec.; the 12·3 miles on to Surbiton occupied 12 min. 20 sec., 11 min. 1 and 45 sec., and the 8·2 miles on to Clapham Junction, including signal checks in the two latter cases, 8 min. 50 and 52 sec. and 9¼ min.—total 88. min. 20 sec., 85 min. 38 sec. (85 net), and 87 min. 10 sec. (86 min. net) from Southampton. The usual delays were experienced outside Waterloo, and, in place of the allowed time of 92 min., the actual times were 96 min. 20 sec (95¼ min. net), 93 min. 38 sec. (92 min. net), and 95 min. 35 sec. (93 min. net) from Southampton to Waterloo. In view of the high speeds which once obtained between Basingstoke and Waterloo, these results are rather disappointing; No. 446, for example, eased very pronouncedly through Basingstoke and Woking, and did not exceed 67 m.p.h. before Hook, nor 69 m.p.h. before Woking. Load considered, No. 736 doubtless comes best out of the comparison, with No. 466 a good second, and No. 446 a bad third.

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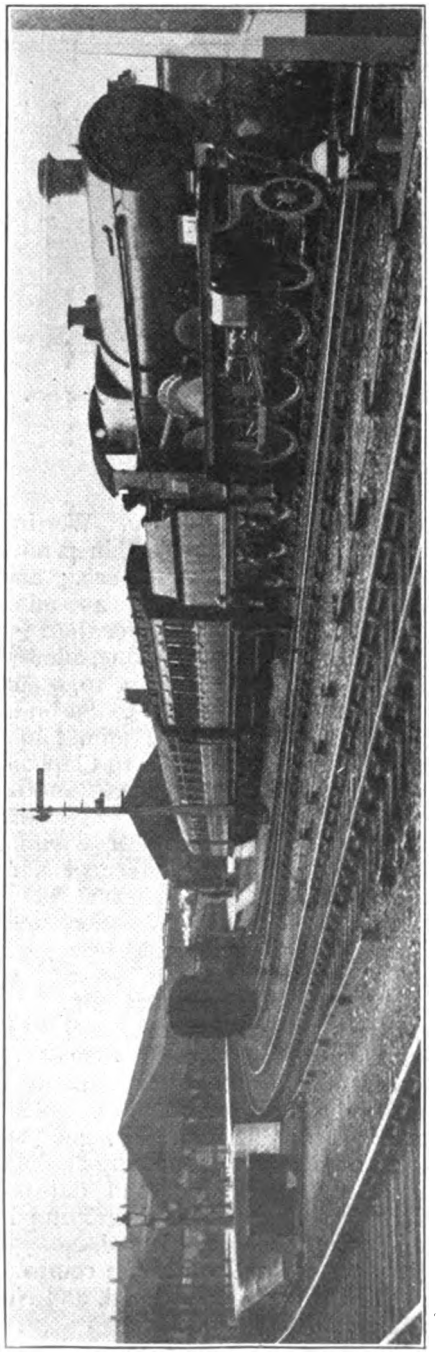
New Aberdeen-Penzance Through Service,

GREAT WESTERN AND EASTERN GROUP RAILWAYS.



INAUGURAL TRAIN AT PLYMOUTH ON RETURN JOURNEY.

INAUGURATED on October 3, this is certainly the most outstanding of the various through-service developments brought into force on the same date. In conjunction with the other cross-country facilities, both those already existing and those newly introduced, this service provides many exceedingly useful connections. It is also of note in that, with others, this service evidences a praiseworthy spirit of co-operation, not only between railways to be placed in the same group, but also between those of two or more groups.

This service, which runs every week-day, leaves Aberdeen at 9.45 a.m., Edinburgh 1.30 p.m., Newcastle-on-Tyne 4.21 p.m., York 6.25 p.m., Sheffield 7.36 p.m., Leicester 9.4 p.m., arriving at Banbury at 10 p.m., Oxford 10.33 p.m., Swindon 11.30 p.m., Exeter 2.46 a.m., Torquay (Torre Station) 3.50 a.m., Plymouth 4.25 a.m., Newquay 7.25 a.m., Falmouth 7.23 a.m., St. Ives 8.36 a.m., and Penzance at 7.40 a.m. In the reverse direction the train leaves Penzance at 11 a.m., St. Ives 10.25 a.m., Falmouth 11.20 a.m., Newquay 11.15 a.m., Plymouth 2 p.m., Torquay 2.23 p.m., Exeter 3.27 p.m., Swindon 6.15 p.m., Oxford 7.7 p.m., Banbury 7.42 p.m., arriving at Leicester at 8.38 p.m., Sheffield 10.4 p.m., York 11.15 p.m., Newcastle-on-Tyne 1.20 a.m., Edinburgh 4.5 a.m., and Aberdeen at 7.40 a.m.

Prior to the first public journeys inaugural press runs were made as follows :

THURSDAY, SEPTEMBER 29, 1921.

Southward Journey.

		a.m.	
Aberdeen ..	.. dep.	9.45.	
Dundee ..	.. ,,	11.41	
		p.m.	
Edinburgh (Waverley)	,,	1.25	luncheon.
Newcastle ..	,,	4.15	
Darlington ..	,,	5.13	tea.
York	,,	6.25	
Sheffield (Victoria)	,,	7.36	dinner.
Nottingham (Victoria)	,,	8.31	
Leicester (Central)	,,	9.4.	
Banbury	,,	10.5	
Oxford	,,	10.40	sleeping berths ready.
Swindon ..	,,	11.30	

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ABERDEEN-PENZANCE THROUGH CARRIAGE AT PENZANCE.

FRIDAY, SEPTEMBER 30, 1921.

		a.m.	
Taunton ..	..	dep. 1.30	
Exeter ..	..	,, 2.10	
Newton Abbot	..	,, 2.40	
Plymouth ..	..	,, 3.40	
Truro ..	..	,, 5.5	
Penzance ..	..	arr. 6.0	May remain in sleeping berths until 8 a.m.

FRIDAY, SEPTEMBER 30, 1921.

Breakfast, 8.30 a.m., Queen's Hotel, Penzance.
Motor tour to Land's End, St. Ives, The Lizard, &c.
Luncheon, Great Western Railway, Tregenna Castle Hotel, St. Ives.
Dinner, Queen's Hotel, Penzance, 7.30 p.m.
Sleep at Penzance.

SATURDAY, OCTOBER 1, 1921.

Northward Journey.

Breakfast, 8.30 a.m., Queen's Hotel, Penzance.

		a.m.	
Penzance ..	..	dep. 11.45	
		p.m.	
Truro ..	..	arr. 12.35	luncheon.
Plymouth ..	..	,, 2.5	
Newton Abbott	..	,, 3.5	
Exeter ..	..	,, 3.38	
Taunton ..	..	,, 4.20	tea.
Swindon ..	..	arr. 6.12	
Oxford ..	..	,, 7.0	
Banbury ..	..	,, 7.38	dinner.
Leicester (Central)		,, 8.39	
Nottingham (Victoria)		,, 9.10	
Sheffield (Victoria)		,, 10.4	
York ..	..	,, 11.18	sleeping berths ready.

SUNDAY, OCTOBER 2, 1921.

		a.m.	
Darlington	..	arr. 12.27	
Newcastle ..	..	,, 1.25	
Edinburgh (Waverley)	..	,, 7.5	
Edinburgh (Waverley)	..	dep. 7.40	breakfast.
Dundee ..	..	arr. 9.18	
Aberdeen ..	..	,, 11.23	

The sketch-map reproduced depicts the route followed by the trains forming the new service, and clearly shows how, except for additional mileage between York and Swindon (204 miles) on the southward journey and Westbury and York (224 miles) on the northward journey, existing train services are utilised for the longest through services in the British Isles, viz., 785 miles.

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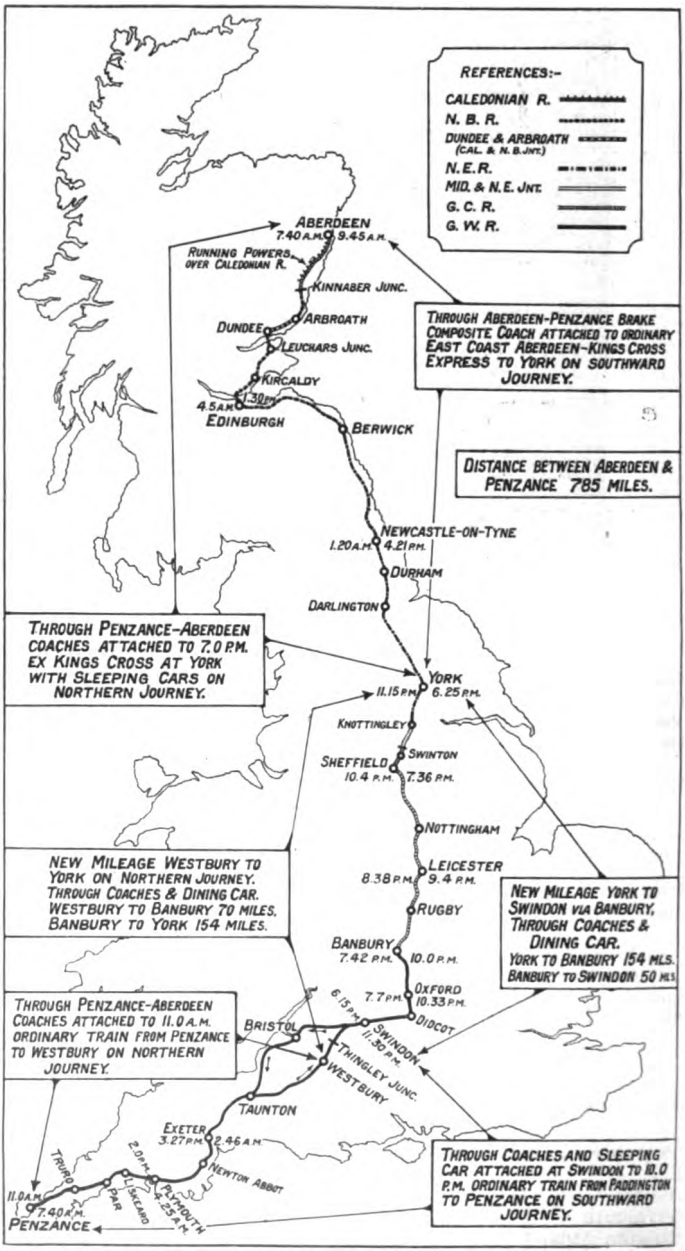
The through service between Aberdeen and Penzance is maintained by the undermentioned passenger rolling-stock :— (i) Through Aberdeen–Penzance, brake composite coach (North British and Great Western stock alternately). (ii) Through York-Penzance, brake third (Great Central stock). (iii) York-Swindon, brake first ; composite dining-car and open third (North Eastern and Great Western stock alternately). At Swindon the Aberdeen-York-Penzance coaches are attached to a Great Western Company's through express to Penzance, with sleeping cars. Similar rolling-stock and arrangements obtain on the journey between Penzance and Aberdeen.

To the inaugural runs some 60 press representatives were invited, not only from London, but from the principal towns and cities served by the new service. Representatives of the several railway companies concerned in the service included :— *Great Western Railway :* Mr. S. A. Pope, Commercial Assistant to the Superintendent of the Line ; Mr. W. Herne, Timetable Section, Office of Superintendent of the Line ; Mr. F. Crabtree, Advertising Department ; Mr. S. H. Roberts, Restaurant Car Department. *North Eastern Railway :* Mr. Alex. Wilson, Assistant General Manager ; Mr. W. M. Teasdale, Trade Advertising Agent ; Mr. H. Gent, Hotels and Restaurant Car Superintendent ; Mr. G. Elliott, Passenger Time - Table Department. *Great Eastern Railway :* Mr. H. J. Prytherch, Indoor Assistant to Superintendent of Operation. *Great Northern Railway :* Mr. J. W. Oddy, Advertising Department. *Great Central Railway :* Mr. J. Smith, Advertising Department. *Great North of Scotland :* Mr. W. Johnston, Superintendent of the Line. *North British Railway :* Mr. W. Aitken and Mr. R. Gardiner.

The guests were given an opportunity



ROUTE AND OTHER PARTICULARS REGARDING NEW ABERDEEN-PENZANCE THROUGH SERVICE.

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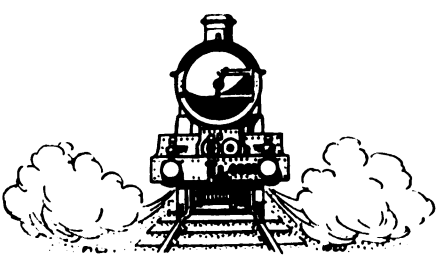
of either making the whole journey or joining the train at any of the stations *en route*, whilst arrangements were also made for those London journalists who wished to journey from Paddington to join the through train at Swindon and to leave it there on the return journey. On Friday the party were conveyed in Great Western Railway road motor cars from Penzance to the Land's End, and thence by the Atlantic Drive past St. Just and Gurnard's Head, to St. Ives, where lunch was served at the Tregenna Castle Hotel. In the afternoon the party were taken to the Lizard and thence back to Penzance. Glorious weather favoured the expedition, which extended over some 70 miles. After dinner, on Friday evening, at the Queen's Hotel, Penzance, a few informal speeches were made.

Mr. S. A. Pope, Commercial Assistant to the Superintendent of the Line, Great Western Railway, on behalf of the Great Western Railway Company, offered the visitors a most hearty welcome to the Cornish Riviera. He hoped that what had been shown to them that day would enable them to impress on others the beauties of the district they had seen. For many years past the Great Western Company had favoured the Devon and Cornish Rivieras. What they had done in the past had now been expanded by the new service enabling people from Scotland and the North Eastern and Central districts of England to travel with ease and comfort and without change to Cornwall. They had experienced that day the glories of an Indian summer, but they must not take it as an exception. He assured them it was a fair sample of the weather prevailing in Cornwall during the autumn and winter. If well patronised the through facilities which had been provided in the new service might lead to something far greater in the near future. On behalf of the Great Western Railway Company he extended to them a most hearty welcome. Mr. Alex. Wilson, Assistant General Manager, North Eastern Railway, expressed his appreciation of the fact that so many journalists had accepted the invitation to take part in the inaugural run of the new Aberdeen-Penzance through service. Those who had had the temerity to travel from Aberdeen had full experience of what the new service was like, and he need say no more about it. Naturally, during and in the years immediately after the war, the companies could not give the public the facilities they desired. But at length the Government control had been thrown off, and now they could set about their business. The railway companies could manage their business if left alone. Recently legislation had been imposed on them which involved the grouping of the railways. At first some of them did not care about it, but they were making the best of it, and hoped to give the best possible service to the public. The public were the masters and the railway companies the servants, and if they gave good services they would get their reward. The Eastern group were very glad to join with their friends, the Great Western, in running the new service.



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Signalling Exhibits

AT THE LONDON & SOUTH WESTERN RAILWAY SIGNAL WORKS AT WIMBLEDON.

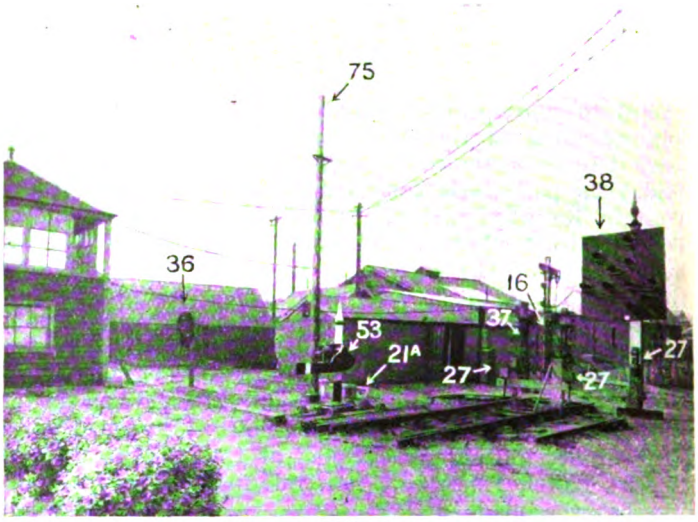

FIG. 1.

IN connection with the summer meeting of the Institution of Railway Signal Engineers a visit was paid to the London & South Western Railway Signal Works, by invitation of Mr. W. J. Thorrowgood, Signal and Telegraph Superintendent. For the information of the visitors, Mr. Thorrowgood arranged for an exhibition of types of signal and telegraph appliances as used by the London and South Western Railway, together with appliances lent by manufacturers, 93 exhibits being thus placed on view.

The exhibition was highly appreciated by the visitors, and was also made available for inspection by parties of the railway staff and others interested, especially as it included examples of a number of special appliances, some relating to developments in railway signalling and telegraphic practice which are being very carefully considered by railway officers. Among them may be mentioned the following :—.

Light signals for day and night use, with the lights distinctly seen at a distance in brilliant sunshine ; three-position semaphore ; upper quadrant signal, with its three-coloured glasses for night indication, together with the single wire arm and light repeater ; the French electric signal motor, which, although small, and in spite of several attempts to prevent it working to the " off " position, was very effective ; the laryngaphone, a telephone placed on the throat and operated by the larynx, instead of the voice-sounds, the conversation being distinctly heard amidst the excessive noise of machinery ; the telephone control system of the Western Electric Company, on which as many as 100 instruments can be connected ; the unit of the automatic telephone systems now being installed at Waterloo for the new offices ; the first model of the late W. R. Sykes, illus-

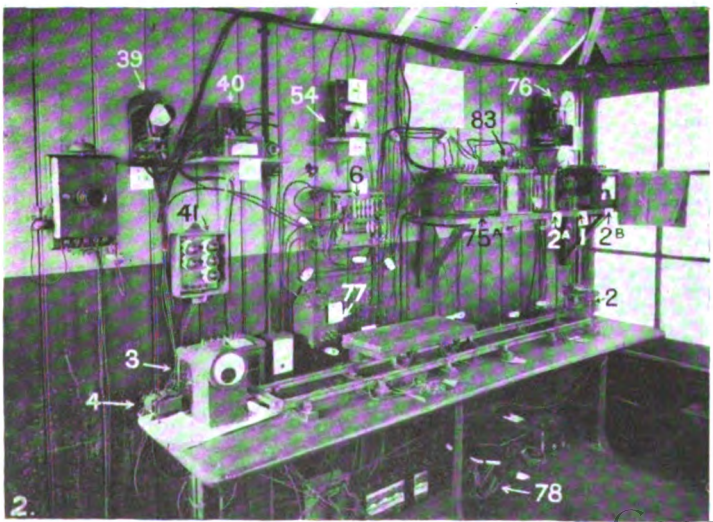

FIG. 2.

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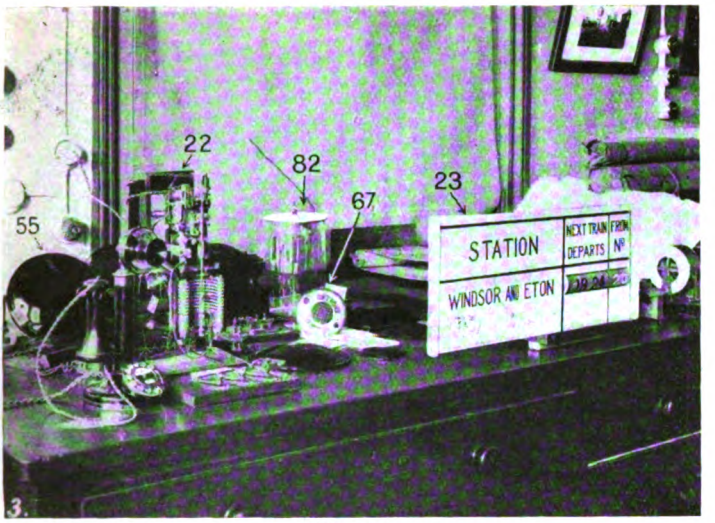

FIG. 3.

trating the lock-and-block system; and the Syx-Tiddeman automatic train control system as used on the Great Eastern Railway. The company's insulated tools, apparatus for repeating fog signals in the cab of the engine, and the track circuit in the Signal School, were all minutely examined and discussed.

The working of the electric point movement to be used at Feltham Gravitation Yard, connected to the hump boxes, was a surprise for most of the visitors, as it could be operated backwards and forwards 20 times in 15 seconds. Several trials were made to put the movement and apparatus out of order, without success.

Eight views are reproduced, showing the principal exhibits, as follows :—

Fig. 1 is a general view of the exhibits in the yard. The Signal School is seen on the extreme left. (16) Electric signal machine used at Waterloo. (21A) Sample of L. & S.W.R. reinforced concrete fittings. (27) L. & S.W.R. apparatus for repeating fog signals in the cab of engine. (37) Westinghouse Brake & Saxby Signal Company, signal replacer. (36) Westinghouse Brake & Saxby Signal Company, two-colour light signals (red and green). (38) Three-position light signal (all lights white), invented by Mr. Rudd, of America, introduced by the Westinghouse Brake & Saxby Signal Company. (53) British Power Railway Signal Company, three-position semaphore electric signal, with arm and light repeater complete. (75) Bates' expanded steel pole, made from ordinary H-iron, suitable slots being cut in web; it is placed in a machine and expanded.

Fig. 2: A view in the Signal School. (1) British Power Railway Signal Company, direct-current track circuit relay. (2A) Single element vane track circuit relay, old pattern American. (2A) Westinghouse Brake & Saxby Signal Company, single element vane track circuit relay. (2B) Westinghouse Brake & Saxby Signal Company, double element vane track circuit relay. (3) Westinghouse Brake & Saxby Signal Company, galvanometer track circuit relay. (4) Westinghouse Brake & Saxby Signal Company, track circuit transformer. (6) Track service car,

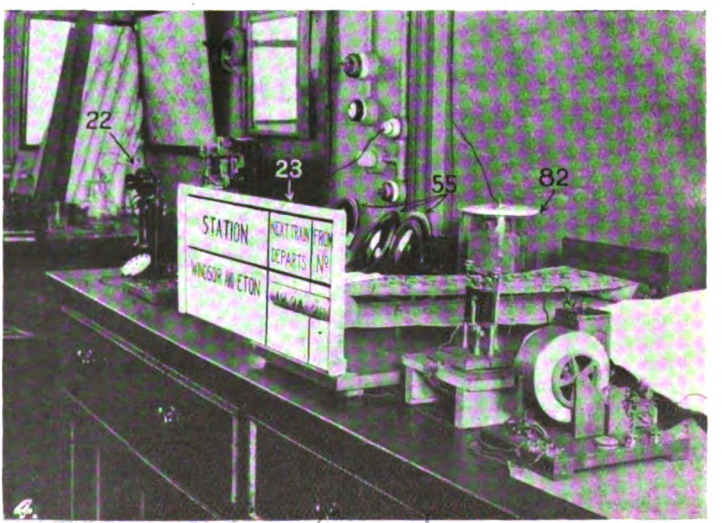

FIG. 4.

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with thermal regulator and L. & S.W.R. wire regulators. (39) Westinghouse Brake & Saxby Signal Company, indicator repeating relay. (40) Westinghouse Brake & Saxby Signal Company, direct-current track circuit relay. (41) Thermal regulators in case for D.C. track circuits. (54) British Power Railway Signal Company, arm and light repeater. (76) British Power Railway Signal Company, indicator repeater relay. (77) British Power Railway Signal Company transformer. (83) British Power Railway Signal Company, centrifugal track circuit relay, used at Clapham Junction.

Fig. 3: A view of exhibits on bench. (22) A unit of the automatic telephone exchange (Siemens' system) now being installed at Waterloo. (73) Proposed automatic platform indicator, giving departure times of trains to all stations on the L. & S.W.R., controlled by the electric clock system at Waterloo. (55) British Power Railway Signal Company, coloured glasses (red, amber and green). (67) Foot contact. (82) Columbia caustic soda cell.

FIG. 5.

Fig. 4: Another view of bench seen in Fig. 3. (23) Platform indicator. The vibrator and timing drum controlled by the master electric clock at Waterloo is shown on right; the other numbers are the same as in Fig. 3.

Fig. 5: General view of the electric point movement to be used at Feltham Gravitation Yard.

Fig. 6: An enlarged view of the point movement. (14) Electric point movement. (34) Model of Sykes' signal replacer. (43) Automatic Telephone Manufacturing Company, signal replacer. (68) General Electric Company, sleeper contact system, to replace flagmen protecting men working on the line. (61) Bar balances for working bars and points easily.

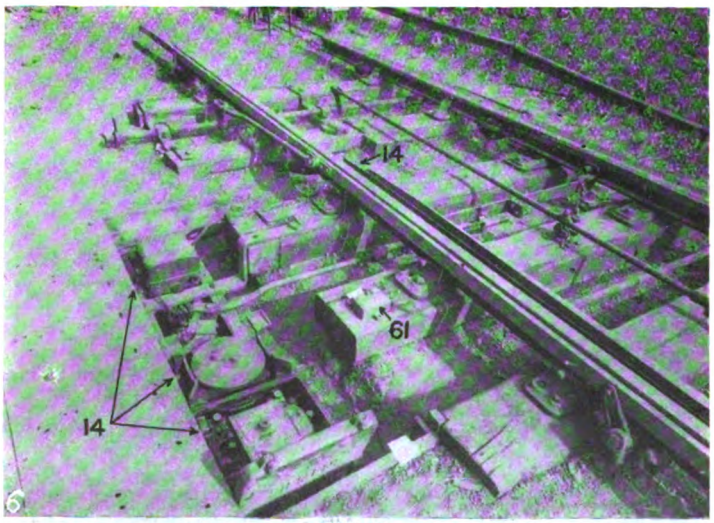

FIG. 6.

Figs. 7 and 8 show apparatus in cabin. (15) Push button frame (model) for Feltham Yard hump boxes. (17) L. & S.W.R. insulated footplates. (20) L. & S.W.R. track circuit train shunt resistance box. (21) L. & S.W.R. insulated tools made by British Power Railway Signal Company. (21B) L. & S.W.R. gravity battery zinc. (35)

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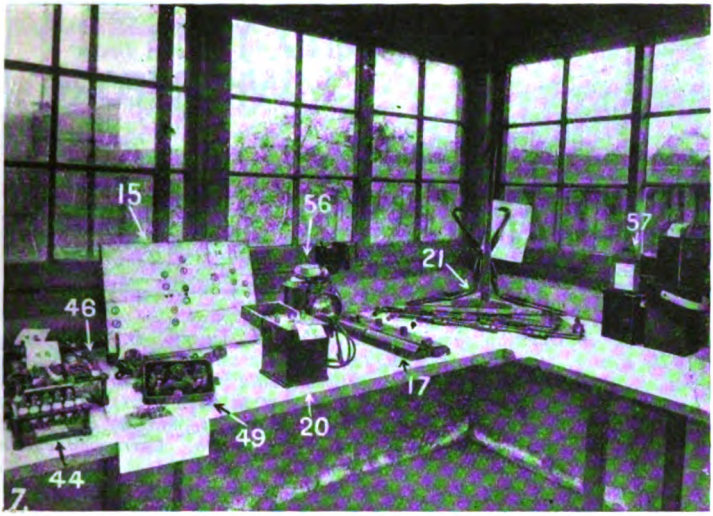


FIG. 7.

Syx-Harper single-wire block. (44) Automatic Telephone Manufacturing Company, track circuit relay. (46) Automatic Telephone Manufacturing Company, point detector relay. (49) Automatic Telephone Manufacturing Company, point detector. (56) British Power Railway Signal Company, Adlake signal lamp. (56A) British Power Railway Signal Company, Bryant battery zinc. (57) Accumulators of working battery. (59A) Eyre battery zincs. (63) General Electric Company, track circuit testing set. (63A) General Electric Company, track circuit relay. (64) General Electric Company track circuit indicators. (65) General Electric Company, track circuit resistance units. (66) General Electric Company polarised relay, as in Waterloo telephone switchboard. (71) General Electric Company, Carsack cell. (72) General Electric Company, Pigilite wire to replace lead covered track. (72A) General Electric Company, rail joint insulation. (73) Pritchett & Gold's accumulators. (74) D.P. Company accumulators.

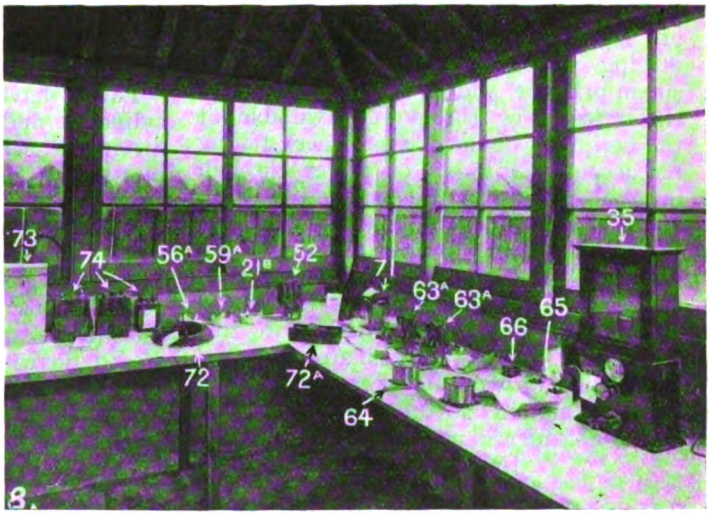
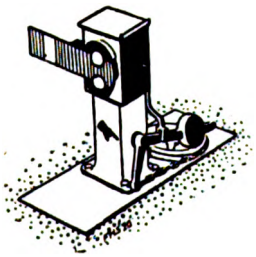


FIG. 8.



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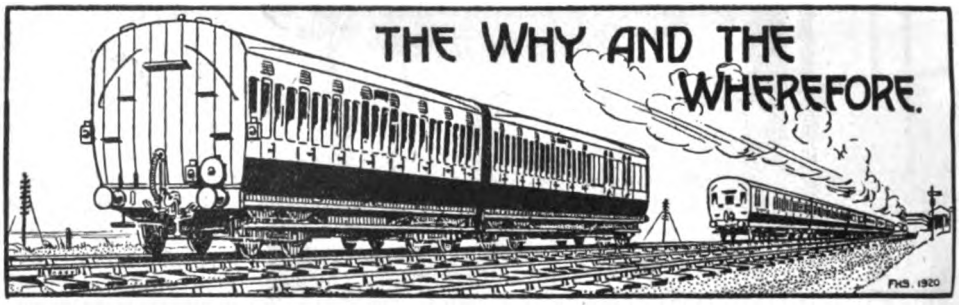

RAILWAY MAGAZINE *readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to locomotive sheds and to the dimensions of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. Queries respecting British Locomotive Practice and Performance should be sent to Mr. Cecil J. Allen, c/o* RAILWAY MAGAZINE, 30, *Fetter Lane, Fleet Street, London, E.C.4. Queries should not be of purely local interest. No reader should forward more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history and the like, readers should consult the pages of the "Railway Year Book." The twenty-fourth Annual Edition of this standard railway reference work is now on sale, 5s. net, or by post from the* RAILWAY MAGAZINE *Offices, 5s. 9d.*

Tractive Effort of Locomotives.

"Nominal tractive effort" and "Tractive effort" are one and the same; they are figures based solely on cylinder and driving wheel dimensions and working steam pressure, and represent what should theoretically be the power available at the periphery of the driving wheel, taking no account of losses of power through internal friction in the locomotive itself. It is on this account, and also because the tractive force formula does not take into account capacity for raising steam, that we have emphasised the word "nominal" in previous replies in this connection. It is unfortunate that the percentage of working pressure used in this calculation so often varies; we should consider 80 per cent. a fair average.

[Reply to "METROGEN."]

"Claughtons" on North Wales Division, London and North Western Railway.

We note that two of these engines are now stationed at Llandudno Junction and one at Bangor, and that the former work regularly on the "Club" train between Llandudno and Manchester. In regard to the fact you mention as to these trains having been worked with heavier loads in the past by small "Renown" class 4-4-0's on a faster schedule, you should read carefully Mr. Cecil J. Allen's article in the current issue, which has much to say on the subject of "large" *versus* "small" engines. We have no information as to the number of "Claughtons" fitted with "pop" safety-valves.

[Reply to H. STONE.]

"486" *v.* "736" 4-6-0 Classes, London and South Western Railway.

Latter have 22 in. in place of 21 in. cylinders, and 6 ft. 7 in. in place of 6 ft. driving wheels, and are therefore better fitted for express work. The taper boilers of the "736" class are also of slightly smaller diameter than the parallel boilers of the "486" class. Advantage was taken of experience gained with the latter to introduce various modifications of detail into the design of the former, which have greatly increased the efficiency of working. See Mr. Allen's article in current issue. Nominal tractive effort of both types, at 80 per cent. working pressure, is 24,700 lb.

[Reply to F. P. MILLARD.]

Motor Trains on South Eastern and Chatham Railway.

The train you have noted in which the engine was seen propelling four coaches, is one of the "auto" or "motor" trains now largely employed in this country; the engine is permanently coupled to the coaches concerned, and special arrangements enable the driver to operate the train from a proper driving compartment in the front coach, when the engine is running in rear. The object of the motor train is to avoid the necessity of the engine running round the train at terminal stations.

[Reply to "SUBSCRIBER."]

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Express Service over Great Northern & Great Eastern Junction Line.

This is certainly not up to pre-war standards, but it meets the requirements. A service between Liverpool Street and York was more an advertisement than a paying proposition, and in these days of pooled traffic and grouping is not likely to be revived. In place of the three London–York and the one Harwich–York pre-war services, therefore, you have the Harwich–York and Harwich–Liverpool services, together with a new Peterborough–Lowestoft, etc., service, with excellent connections to and from the North *via* the Great Northern main line.

[Reply to P. A. S. HADLEY.]

Railway Carriage Electric Lighting.

Except on electrically-operated lines, on which light is derived from the same source as the power, each electrically-lighted coach usually generates its own current from a dynamo driven from one of the axles, and stores it in accumulators for use as required, fixed under the carriage frame. The lights of each coach are generally controlled in the coach itself, but in the case of "set" trains arrangements are sometimes made for all the lights to be controlled from the guard's brake.

[Reply to L. R. G.]

A Locomotive Comparison.

Tractive effort, at 80 per cent. working pressure, of Great Western Railway four-cylinder 4-6-0's is 26,160 lb.; of Great Central Railway "Lord Faringdon" (four-cylinder 4-6-0), 23,665 lb., and of London and North Western Railway "Claughtons," 23,010 lb. The Great Western engine scores heavily in the matter of working pressure, with 225 lb. per square inch against the Great Central 180 lb. and the London and North Western, 175 lb.

[Reply to R. E. HAMILTON.]

Gravitation Sidings.

We are informed that the following yards on the London & North Western Railway are now operated on the "hump" principle (thus completing the list given in the RAILWAY YEAR BOOK):—Willesden (Brent Sidings), Three Spires Junction, Norton Junction, Carlisle, Northampton, Nuneaton, Hednesford, Bushbury, Rugby, Bescot, Stechford and Bamfurlong. There are no gravitation sidings at Peterborough, Welham Sidings, Coventry and Crewe.

[Reply to C. R. CLINKER.]

Lancashire & Yorkshire Rebuilt 4-6-0 Engines.

We understand that several new 4-6-0's are in service. All those rebuilt are being painted the standard colours as fast as they go through the shops. You are correct in what you say as to the London and North Western "Prince" when hauling the Lancashire and Yorkshire "test" train between Manchester and Blackpool, but you must remember that this particular London and North Western type is considerably smaller, and less powerful than one of the rebuilt Lancashire and Yorkshire engines.

[Reply to A. J. H.]

London and North Western Railway Express Locomotives.

Respective weights in working order (without tenders) of "Claughton" 4-6-0's, "Prince of Wales" 4-6-0's, and "George the Fifth" 4-4-0's are 77¾, 66¼ and 59¾ tons; respective tractive efforts at 80 per cent. working pressure are 23,010, 20,395 and 18,885 lb. For the present no further four-coupled express engines are in course of construction by this company, and we believe that no more are contemplated.

[Reply to "CLAUGHTON."]

London and North Western Railway Locomotives.

Outside cylinder 4-4-0 engines on this railway are the few that remain of the four-cylinder Webb compounds; the others have now been converted to inside cylinder 4-4-0's of the "Renown" class (in external appearance smaller versions of the "Precursors"). The 2-4-0 engines are generally known as the "Precedent" class, or more familiarly as "Jumbos." The rest of your query is not clear.

[Reply to "PATRIOT."]

Great Northern Railway 2-6-0 Engines.

New "Moguls" of the 1680 series, now being delivered from private builders, and painted green, are identical in design with the engines numbered from 1650 to 1669. Now that the enormous loads of the coal dispute period are no longer in evidence, there is no object in continuing the "1000" class engines on passenger service, as the "Atlantics" are much more

suitable locomotives for high speed work with moderately-loaded trains.

[Reply to W.C.W.]

"The Great Bear," Great Western Railway.

Present temporary workings of this engine were given last month; as regards future workings we have no information (although we consider it most unlikely that the engine will be used on the trains you mention), nor in regard to the other query you raise. No notable runs with this engine have been described in the RAILWAY MAGAZINE, and we are not aware of any having been made.

[Reply to G. E. H. ROBERTS-HAY-BOYD.]

Welwyn Garden City Station, Great Northern Railway.

You are correct in suggesting that many years ago a station existed approximately on the site of that now provided to serve Garden City residents. The old Welwyn Junction station was opened in 1858 for main line trains, and seems to have fallen into disuse upon the opening of the Dunstable branch in 1860, probably due to the fact that the branch trains ran into Hatfield as they do to-day.

[Reply to R. B. FELLOWS.]

"Precursor" Locomotives, London and North Western Railway.

Your statement is noted that although the heating surface of the "Precursor" class locomotive first built was 2,009 sq. ft., the later ones had the tubes re-arranged and their number reduced, making the heating surface 1,962 sq. ft., the firebox area being unaltered except for the small addition due to the fact that a few tubes were omitted.

[Reply to E. C. POULTNEY.]

Plymouth, Devonport and South Western Junction Railway.

We are informed by Mr. S. G. Hartnell, General Manager of the Bere Alston and East Cornwall section, that the sections between Callington and Calstock are controlled by Tyers' electric train tablet, and between Calstock and Bere Alston Junction on Annett's train staff and ticket system. Gunnislake is the only crossing station.

[Reply to "INTERESTED."]

Quintinshill Accident, Caledonian Railway.

This accident was attributed to the fact that, on changing duty, the relieved and relieving signalmen, with the fireman of the shunted waiting train, were apparently chatting. It was certainly not hushed up; instead, a great deal was published. The Board of Trade report is a voluminous one, and in the RAILWAY MAGAZINE and elsewhere the subject received special attention.

[Reply to T. A. LITTLE.]

To Eastbourne by South Eastern and Chatham Railway.

In early railway days the South Eastern Railway at one time desired to extend to reach the Eastbourne district, and the matter was compromised by giving them limited running powers over the London, Brighton and South Coast Railway south of Tunbridge Wells. In later years the through trains gave place to through carriages, and these ran until quite recently.

[Reply to R. B. FELLOWS.]

Derelict Railways in North Wales.

Work was commenced on a railway to connect Portmadoc with the North Wales Narrow Gauge Railway at Snowdon Ranger terminus, *via* Beddgelert, but lack of funds caused the abandonment of the project. The line would have passed through the Pass of Aberglaslyn, where, as you mention, there are clear evidences remaining of the preparatory work that was carried out.

[Reply to "POONA."]

Junction at Liverpool Street (Met.).

Diverging line seen at the west end of this station, running into a tunnel, at one time connected the Metropolitan and Great Eastern Railways, and was used by a service of Metropolitan trains running into Liverpool Street (Great Eastern Railway). The connection has now been long out of use, however, and there is no actual communication remaining with the lines of either railway.

[Reply to D. CAMPBELL.]

An Unusual Route, Caledonian Railway.

We cannot understand why the train you mentioned should have travelled from St. Rollox to Rutherglen and Coatbridge, but the actual route taken is not clear and is too complicated to enable us to work out the distances for you, especially as they can hardly possess any particular interest from the timing point of view, over this section.

[Reply to "ST. ROLLOX-RUTHERGLEN."

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Great Eastern Railway Works Locomotive "Chairman."

This little 0-4-0 engine, which lost its name some years ago, and has since been known as "A Works," is not now employed as works shunter at Stratford, its place being taken by a more powerful 0-4-0 locomotive, No. 210. We understand the *Chairman* is still in existence, but cannot state where it is now employed.

[Reply to "LOCOMOTIVE."]

Grouping of Railways.

Presumably present titles will disappear when grouping is completed, and each group will in effect constitute a complete railway system. No decision has yet been made public as to the names which will apply, nor as to the proposed organisations. In any case, it will be some years before any great change is apparent in regard to locomotives and rolling-stock.

[Reply to H. FORDE.]

Loading Docks.

Hinged plates above the buffer-stops at the end of platforms indicate equipment for loading road vehicles into the end doors of motor car wagons, and similar wagons designed to carry road vehicles. The hinged plates are lowered on to the floor of the wagon, into which it is then an easy matter to run the vehicle.

[Reply to D. CAMPBELL.]

"Triangular" Stations.

In addition to Ambergate, Midland Railway, mentioned by you, there is Rutherglen on the Caledonian Railway. Possibly readers may be able to cite others having platforms on three sides, though in most instances, where triangular formations exist, platforms are provided on two sides only.

[Reply to A. RANSON COWLISHAW.]

Signalling on Ealing and Shepherd's Bush Railway.

The signal by the footbridge over the "flyover" is not three-position. It applies only to the line towards the West London Railway and is of ordinary type, with a fixed "distant" below it to ensure that speed is reduced approaching the West London line.

[Reply to G. N. SOUTHERDEN.]

Tunnels on London, Brighton and South Coast Railway.

Particulars of these are included in the RAILWAY YEAR BOOK. Those of great length on the route between London and Brighton are: Merstham New ("Quarry" line), 1 mile 353 yards; Clayton, 1 mile 506 yards; together with Balcombe tunnel.

[Reply to "SOUTHERN BELLE."]

Compound Engines, London and North Western Railway.

Webb four-cylinder compound engines have two high-pressure cylinders outside and two low-pressure cylinders inside the frames. So few of these engines are still at work in their unconverted condition that it is difficult to say where you could see one.

[Reply to H. S. HACK.]

Large Locomotive Numerals.

Railways in Great Britain at present using large numerals on the tender and tank sides of their locomotives are the Midland, North British, Great Eastern and South Eastern and Chatham. We cannot spare space to give the numbers of the engines so distinguished on the last-mentioned railway.

[Reply to S.M.W.H.]

Mixed Traffic 4-6-0's on Great Central Railway.

These engines are doubtless diagrammed for the 6.25 and 7.30 p.m. slow passenger trains out of Marylebone, as a convenient "balance" working to some express goods trip in the up direction, being well suited to smartly-timed stopping passenger work.

[Reply to "POONA."]

New Mills and Hayfield, Midland Railway.

Reply given under this heading on page 119 of the August RAILWAY MAGAZINE should have referred to the New Mills and Heaton Mersey section *via* Hazel Grove and Cheadle Heath. Hayfield is the terminus of a branch from New Mills. Your correction is appreciated.

[Reply to W. BESWICK.]

Goods Engines on Passenger Trains.

Certain 0-6-0 engines on the Great Eastern Railway, including the numbers you mention, are fitted with the Westinghouse brake expressly for the purpose of working passenger trains when required. For slow and heavy or stopping passenger duty, they are very handy engines.

[Reply to E. LUFF.]

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West Somerset Mineral Railway.

Of the four engines mentioned, one of the 1866 pair was named *Pontypool*. Another was named *Atlas*, but Mr. Hopwood is unable to say whether this was one of those built in 1857 or 1866, nor has he any record of the other two engines.

[Reply to W. ROWCLIFFE.]

Ely-Newmarket Line, Great Eastern Railway.

From the Ely direction the first junction of the triangle leading towards Newmarket is known as Snailwell Junction; the Bury-Cambridge line is joined at Warren Hill Junction, a tablet box for the tunnel; and towards Bury at Chippenham Junction.

[Reply to C.R.N.]

A 4-6-2 Tank Locomotive Comparison.

Although strictly this question contravenes the rules as to dimensions, we mention that the weight in working order of the London and North Western engines of this wheel arrangement is 78 tons, and of the corresponding Caledonian engines 91¾ tons.

[Reply to F.R.A.]

Metropolitan Railway Pullman Cars.

Had you read carefully you would have seen that the figure given is that of the number of *trains* daily on which the cars work, and not the number of cars themselves. The two cars in regular use last summer each worked four single journeys daily.

[Reply to "PULLMAN."]

Locomotive Building on London and North Western Railway.

No four-coupled express engines have been built by this railway for some time past, and we understand it is not intended further to increase the "George the Fifth" class. Your other query contravenes our regulations.

[Reply to "CLAUGHTON."]

Engines with "Uniflow" or Stumpf Cylinders.

No. 825, two-cylinder 4-6-0, and No. 2212, three-cylinder 4-4-2, North Eastern Railway engines, are still running with this arrangement of cylinders. We have on a number of occasions given the formula for tractive effort.

[Reply to "N.B.R."]

Second-Class on Boat Trains, London, Brighton and South Coast Railway.

Special second-class carriages, including a Pullman car, are run on the boat trains between London and Newhaven, although second-class is not used elsewhere on the main lines of this system.

[Reply to "EXILE."]

Air-Cooled Cab Roofs.

Type of cab roof employed on 2-8-0 No. 4700, Great Western Railway, is of steel, specially designed in order to provide efficient ventilation by means of currents of air produced by the motion of the engine.

[Reply to H. O. CHILCOTT.]

Great Western Railway Speeds.

Particulars to which you refer were quoted from Mr. Cecil J. Allen's article on "British Locomotive Practice and Performance" in the September issue. Great Western running will be dealt wth by this writer in the December issue.

[Reply to C. J. G.]

Great Central Railway Named Locomotives.

Your query contravenes the rules governing the "Why and Wherefore" section. Most of the information you desire has already been given in the pages of the RAILWAY MAGAZINE.

[Reply to "MOUNTAINEER."]

A Locomotive Mystery.

As the Midland Railway owns no "Precursor" engines, and the London and North Western no "Atlantics," we find some difficulty in expressing an opinion as to which is "the most powerful from a pulling point of view."

[Reply to "BLAIRMORE AND OTHERS."]

4-6-2 Tank Engines, London and North Western Railway.

We have no record of these engines being used on the West Coast expresses, except when required to bank heavy trains from Tebay to Shap Summit, and occasionally as pilots from Carlisle to Shap.

[Reply to F.R.A.]

London & North Western Railway Non-Stop Runs.

During the summer the 11 a.m. from Bangor to London stopped daily at Crewe, for locomotive purposes, from 1.28 to 1.38 p.m., and therefore did not make a non-stop run from Prestatyn to Nuneaton.

[Reply to C.E.T.J.]

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"Glen" Class 4-4-0's, North British Railway.

Practically identical in all respects with the superheated "Scotts," save for having 6 ft. in place of 6-ft. 6-in. driving wheels.

[Reply to D. J. BELL.]

London Suburban Electric Lines.

Beyond Surbiton the Guildford line via Leatherhead is electrified as far as Claygate only. No portion of the London, Brighton and South Coast suburban or main lines is at present being electrified.

[Reply to R. KIRBY.]

Snifting Valves.

Valves to which you refer are snifting valves whose function has frequently been explained in these columns. Consult previous issues.

[Reply to J. C. S. PARSONS and "GLEN LYON."]

Great Central Railway Expresses, Sheffield-York.

These trains are generally worked by North Eastern engines between York and Sheffield, the Newcastle-Swansea through expresses exclusively so.

[Reply to R. E. HAMILTON.]

Longest Railway in the World.

On the basis of mileage the Canadian National Railways now take the lead, since the taking over of the Grand Trunk Railway. The new system has about 23,000 miles.

[Reply to T. W. LINSELL.]

"Prince of Wales" 4-6-0's, London and North Western Railway.

No. 307 is of this type; principal external distinguishing feature of these engines, as compared with the "Experiments," is the extended smokebox.

[Reply to H. S. HACK.]

4-6-2 Tank Engine, No. 167, Great Central Railway.

Photograph in the August issue was supplied officially by the Great Central Railway; conversion to oil-burning was due to the coal strike.

[Reply to CLAUD ALDRIDGE.]

New Superheated "Atlantic" Engines, North British Railway.

Weight of engine in working order is 76¾ tons, which is 4¼ tons less than that of the new Caledonian three-cylinder 4-6-0's.

[Reply to "TEREBUS."]

"The Great Bear," Great Western Railway.

No details have been published in regard to any test of this engine on the Swindon testing plant subsequent to rebuilding with superheater.

[Reply to "GREAT BEAR."]

Heaviest Locomotive.

No. 4,700, the Great Western Railway 2-8-0 mixed-traffic locomotive weighs 77¾ tons in working order, engine only, and not 82 tons as you suggest.

[Reply to A. W. MAINWOOD.]

District Railway Steam Locomotives.

Two of the old 4-4-0 steam locomotives are still in existence, employed about the Lillie Bridge depôt and for ballast trains out on the line.

[Reply to "M.E.T."]

Early Railways amalgamated with Great Western Railway.

Vale of Neath, 1863; Llanelly Railway and Dock, June 24, 1889; Llynvi and Ogmore, July 1, 1883.

[Reply to E. L. A.]

Great Northern Railway 0-6-2 Tank Engines.

These engines are used equally for suburban passenger and local goods traffic in the London suburban area.

[Reply to S. E. SMITH.]

Cab-Signalling, Great Western Railway.

The ramps can be seen at intervals between Paddington and Slough. A number of engines of all types are fitted.

[Reply to E. E. ORAM.]

Midland Railway 0-6-4 Tank Engines.

Diameter of coupled wheels is 5 ft. 7 in. We have no information on the other two points you raise.

[Reply to H. T. HOBBS.]

Three-Cylinder 2-6-0 Engines, Great Northern Railway.

Tractive effort at 80 per cent. working pressure is 28,265 lb.

[Reply to F. P. MILLARD.]

R.O.D. 2-8-0 Locomotives, London and North Western Railway.

We understand that these engines are being disposed of to Roumania.

[Reply to H. STONE.]

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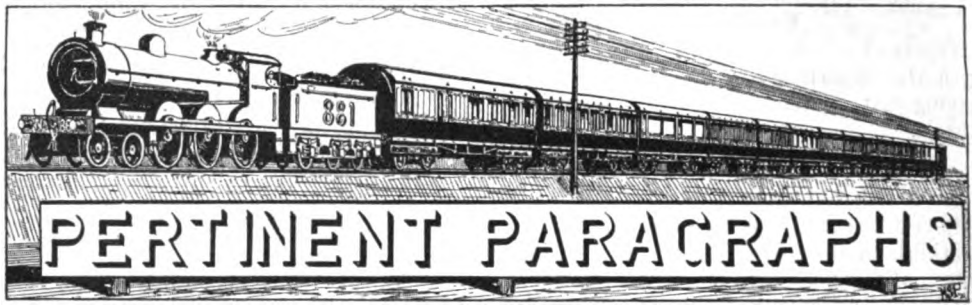

Grouped Railways.

SEVERAL letters received indicate that there is a considerable amount of uncertainty as to what grouping involves and the changes which will follow. Frankly, there is equal uncertainty in the railway world, and in our own minds; but a few remarks may clear the air somewhat, seeing that so many readers refer to the RAILWAY MAGAZINE for guidance and advice as well as in regard to information regarding railway developments and occurrences.

H. J. H. raises the financial question. The RAILWAY MAGAZINE has generally refrained from dealing with such aspects, its scope being already sufficiently wide, without encroaching upon ground covered by prominent newspapers and railway journals such as the *Railway Gazette and Railway News*. The present issue is whether the railways of each group are to be fully amalgamated to form a single new company, or whether they will still maintain their separate company existence, as in the case of the South Eastern and London, Chatham and Dover Railway Companies, which operate through a Managing Committee. Seeing that the number of directors for each group are specified in the Railways Act, obviously complete amalgamation and the formation of new companies must be contemplated. This involves many difficult problems, to convert stocks and shares of many descriptions and of widely varying values, on a fair and equitable basis. But it may be taken for granted that railway shareholders will not suffer, as a whole, in the process of conversion; though there may be some cases of hardship. The trouble with railway shareholders is, rather, that values are based so much upon pre-war conditions, and that there is little or no provision for the altered money values. The raising of new capital is also a very serious difficulty, in view of the general financial situation. The Railways Act provides for the compensation of directors and officers whose positions are no longer required. We are not aware that there are any "large reserve funds" available on a general basis. The reserve funds, together with the share of the Government contribution of £60,000,000, with £3,000,000 for the Irish railways, will be entirely required to cover arrears of maintenance and equipment, and for restoring operating solvency. These demands will not leave much for new developments, nor, indeed, are they intended therefor. The Government contribution is a settlement in compromise of claims against the State, and in no sense a subsidy.

No doubt many changes will follow in due course, but developmental schemes must wait their turn and until the money market enables capital to be raised on reasonable terms. Indeed, we anticipate few outstanding changes, beyond what can be done without raising new capital, for some years to come, and it will be a considerable period before the identities of the respective companies become lost. Already the grouped railways are working together to some extent, but it will be years before the individualistic characters of the respective railways, their locomotives and rolling-stock, &c., disappear.

"Conductor-Guard" Trains.

THE Great Eastern Railway is developing the principle of "conductor-guard" working on branch trains already in use on certain light railways and light traffic sections, and generally analogous to the methods adopted where rail motor cars or motor trains are employed on other lines, as a means for operating less remunerative branches more economically. Incidentally this enables facilities to be increased and avoids any possibility that such sections or particular stations might have to be closed as not being able to pay their way.

As now introduced, modern corridor main line rolling-stock is employed, thus giving branch travellers greater comfort and permitting of steam heating during the winter months. The "conductor-guard" has a complete set of single and return tickets to meet standard requirements, and in order to cover instances where

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through tickets are ordinarily issued at a fare less than the sum of the branch fare and the continuation on the main line, provision is made whereby, although re-booking is necessary, only the difference between the branch fare originally paid and the through fare is charged. An important factor is that goods, milk and other traffic at intermediate stations can usually be operated within the ordinary eight-hour day, and beyond that period there is no need for station staffs except in the signal-boxes, ticket issuing and collecting being dealt with on the trains.

Special rolling-stock may eventually be introduced, but for the time being the experiment is being carefully watched. It appears to offer very wide possibilities, and we fully anticipate to find it adopted on many more sections, either regularly, or on Sundays or days when traffic is relatively light. It is at present in operation on the Bentley–Hadleigh, Cambridge–Mildenhall, Mellis–Eye, Heacham–Wells, and Thetford–Bury St. Edmunds branches, and on Sundays between Epping and Ongar.

New Train Services, October.

COMMENCING October 3 many notable train service developments came into force, of which only a partial indication could be given last month. Easily of chief interest is the fact that the Great Western Railway has given us virtually a complete pre-war time-table, including the following runs of special note :—

Between —		Miles.	h.m.	m.p.h.
Paddington and	Bath ..	106¾	1·45*	61·0
,,	Bristol via Box ..	118¼	2·0	59·1
,,	Bristol via Badminton	117⅝	2·0	58·8
,,	Westbury	95½	1·38	58·4
,,	Taunton ..	142⅝	2·29	57·5
,,	Exeter ..	173⅜	3·0	57·8
,,	Newton Abbot ..	193¾	3·25	56·7
,,	Plymouth	225¼	4·7	54·8
,,	Leamington	87¼	1·31	57·5
,,	Birmingham	110⅜	2·0	55·3
,,	Worcester	120½	2·10	55·6
Reading and	Taunton ..	106¾	1·55	55·7
Bristol and	Exeter ..	75½	1·23	54·6

* By slip carriage.

Compare these with the 1913–14 winter time-tables and the differences, where they exist, are rather in favour of October, 1921. Besides these, however, are the new through services in which the Great Western Railway is associated with railways in each of the other three groups: Penzance to Aberdeen (dealt with elsewhere in an article), via Banbury, Sheffield, York and Newcastle; Edinburgh to Southampton, again in connection with the Eastern group; Plymouth to Aberdeen in conjunction with the North Western group, besides several other interesting services.

On the Midland the outstanding feature is the number of expresses which start 15 min. later, the adoption of 109 min. down and 107 min. up as the standard timing between St. Pancras and Leicester (instead of 119 min., 99 miles), of 135 min. between St. Pancras and Nottingham (instead of 145 min., 123½ miles), the acceleration of one of the down trains to reach Leeds in 3 hrs. 55 min., and several others to four hours or only a little over, and the introduction of 4-hr. trains between London and Manchester, with many other incidental accelerations. Thus, the 9.35 a.m., 12 noon, and 11.30 p.m. Anglo-Scottish expresses all leave 15 min. later, but reach Leeds and stations north thereof as at present. Similarly the 9.10 a.m. ex-Edinburgh and 9.20 a.m. ex-Glasgow are accelerated to reach London at 6.45 p.m., the 12 noon from Glasgow calls at Trent (for Nottingham), and is accelerated to reach St. Pancras 9.15 p.m., and the 10.40 p.m. (Saturdays excepted) from Glasgow is due at St. Pancras 7.50 a.m. The following features may be specially noted :— London to Manchester in 4 hr.: 10.25 a.m., 2.25 p.m., 6.25 p.m.; Manchester to London in 4 hr.: 9.45 a.m., 12.20 p.m., 4.35 p.m. London to Leicester in 109 min.: 9.50 a.m., 10.25 a.m., 12.15 p.m., 2.25 p.m., 11.45 p.m. Leicester to London in 107 min.: 10.23 a.m., 11.55 a.m. (110 min.), 12.23 p.m., 2.33 p.m., 4.58 p.m., 7.28 p.m., 6.45 p.m. (110 min.). London to Nottingham in 135 min.: 9 a.m., 1.20 p.m., 5 p.m. London to Leeds in 3 hr. 55 min., 12.15 p.m.; in 4 hr., 11.45 p.m. and 4 hr. 1 min., 9.50 a.m. Leeds to London, in 4 hr. 2 min., 3.48 a.m.; 4 hr., 2.45 p.m., 5.15 p.m. Incidentally, many other trains are accelerated, and some of the intermediate times are better than hitherto, while in several instances new trains are added. The express service between Sheffield and Manchester is also restored, four expresses running in each direction.

London & North Western Railway Accelerations.

ON the London and North Western Railway Hooley Hill Station, near Guide Bridge, has been re-opened for passenger train traffic. The outstanding feature of the accelerated train services is the re-introduction of two hours as the standard express timing between London and Birmingham, as mentioned last month. The trains which are thus improved are the 9.10 a.m. and 1.15 p.m., 2.20 p.m., 4.35 p.m., 6 p.m. (Saturdays excepted), and 6.55 p.m. down trains from London and, in the up direction the 8.40 a.m., 11.15 a.m., 12.45 p.m. (Satur-

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days excepted), 4.50 p.m. and 6.20 p.m. from Birmingham (New Street). The 11.30 a.m. down and the 2.30 p.m. up trains each take five minutes longer, as a stop at Coventry is included. All these trains convey restaurant or tea cars. Wolverhampton, of course, shares in this acceleration, the journey time being from 32 to 40 min. additional to the two hours between London and Birmingham. The express train service between London and Birkenhead is also expedited, while good services are given between London and the Central Wales Spas, especially by the 10.45 a.m. express from Euston, which conveys vehicles also for Cambrian Railways destinations.

Speeding-Up on the Great Central Railway.

PRINCIPAL interest in regard to the Great Central Railway attaches to the new through train services of a cross-country character in association with other companies. Notably, the new services between Penzance and Aberdeen; the extension of through restaurant car trains between Southampton and Bournemouth and York, with a through carriage for Bradford, to Newcastle; the restaurant car expresses between York, Sheffield, Nottingham and Leicester and Edinburgh and Oxford, with through coaches between Edinburgh and Southampton; while the Newcastle-Swansea and certain shorter distance through facilities, as between York, Nottingham and Leicester and Oxford are retained. Several well-known expresses are accelerated, notably the 3.15 p.m. and 6.10 p.m. down trains from Marylebone. The former leaves five minutes later but is booked to reach Leicester two minutes earlier than hitherto, thus covering the 103 miles, via Aylesbury, in 109 min.; thence to Nottingham, 23½ miles, 25 min. are allowed; and at Sheffield the train is 11 min. in advance of previous times, Manchester (Central) being reached at 7.45 p.m. instead of 8 p.m. The 6.20 p.m. slips carriages at Woodford and Hinton at 7.42 p.m. instead of at Brackley, and is due at Leicester at 8.14 p.m., thus covering the 107 miles, via High Wycombe, in 114 min.; allowed 25 min. for the run thence to Nottingham, Sheffield is reached at 9.36 p.m., one minute earlier, the arrivals at Bradford and Manchester (London Road) being as before. In the up direction the 8.20 a.m. from Manchester (London Road) is due at Marylebone at 1.13 p.m., an improvement of 5 min. The 10 a.m. from Manchester (London Road) and 9.55 a.m. from Bradford is also due in London 5 min. earlier. The 2.15 p.m. from Manchester (London Road) is expedited to reach Marylebone at 6.40 p.m., a gain of 20 min., 112 min. only being allowed from Leicester to London non-stop, omitting the present Woodford and Hinton and Brackley stops. The Great Northern, North Eastern, Great Eastern and other railways have also made improvements, but these are usually more useful than ornamental on this occasion.

Electric Traction *versus* Steam.

REMARKS under this heading, on the basis of a letter from Mr. W. Bromage, published in the September RAILWAY MAGAZINE, have elicited an interesting reply from Mr. G. L. Payne. He writes:—"Mr. Bromage distinctly implies that the claim for electric traction, whether main line or suburban, lies in the impossibility of designing steam engines to equal the electric locomotive as regards its tractive effort and accelerating qualities. This is the view held by the public and even by engineers, but it is a delusion which should be removed. The claim of electric traction is purely one of economy, since it is a more efficient means than steam by virtue of its higher thermal efficiency. There is no claim by the electrical engineer that a steam locomotive cannot be produced to meet any specified conditions, however arduous or extraordinary, but the electrical engineer does claim that he can design an electric locomotive or train to meet the same specification, that would be lighter, smaller and have more or all its weight available for adhesion. In addition, electric traction is, as already indicated, more economical thermally; it is also cleaner and safer. The electric locomotive can work 22 hours in 24 continuously, whereas the steam locomotive can only operate for about 10 hours per day and 6 days per week.

"Mr. Bromage makes comparisons—biassed in some respects—between two London, Brighton and South Coast Railway trains, one electric and one steam, but he quite omits (presumably because he is unaware) to mention that electric trains leaving Victoria have to run through several dead sections. Further, does he know the exact weights of each train and the relative tractive efforts of their respective driving powers, because for a given train weight and resistance, the energy required to accelerate to a given speed, in a definite time over a specified grade, is a definite figure—however applied. The electric locomotive does the same work more efficiently than the steam and where the traffic density is high, it scores still more over the latter.

"There is romance attached to the steam locomotive, especially historically. The 'Iron Horse' was a new era in the 'means of getting about,' but electric traction is not. It is merely a change in the appearance of

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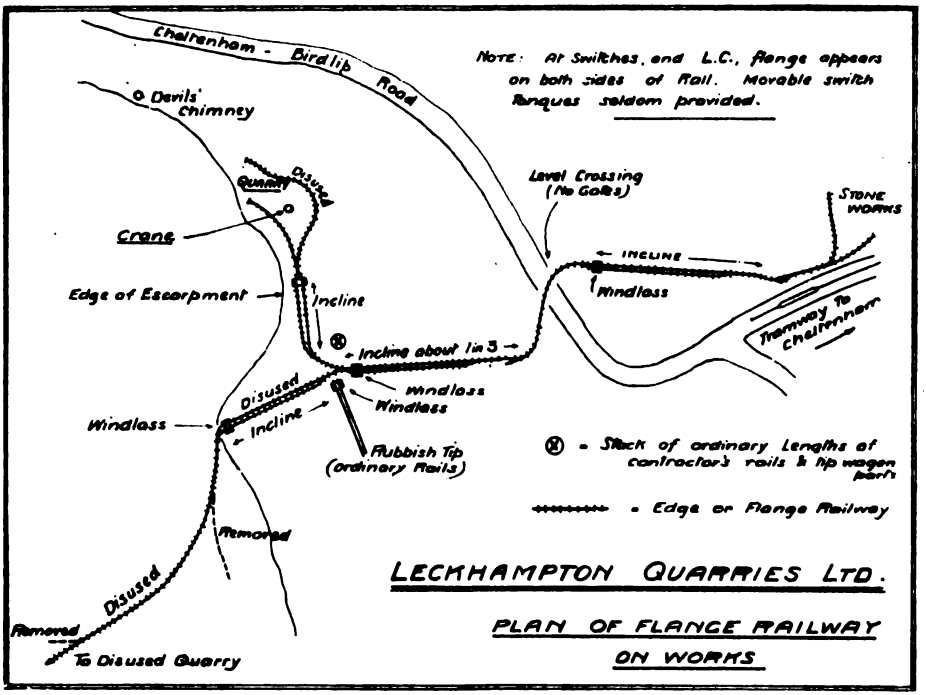
the train to most of us—but what of its wonder! Has the wonder of it ever struck Mr. Bromage—a machine with almost a soul of its own—has he ever sat in an electric train and thought of the links in the system from the coal to the wheel grip on the rail? It is hardly romantic, because there is a mystery that is yet unsolved—so also as a point of fact is the more obvious transmission of mechanical power."

We may point out, however, that the principal point taken by Mr. Bromage was that in so many cases electric trains are not doing the equivalent of that done by a corresponding steam train, but operate under traffic conditions suited to themselves. He was not suggesting that electric traction did not justify itself, but only that if comparisons are to be made they must be on corresponding bases, and this applies both ways.



The Leckhampton Flange Railway.

MENTION in the August RAILWAY MAGAZINE of the old flange railway at Bude, North Cornwall, has caused Mr. C. F. Klapper to write an interesting account of a similar line which he recently came across at Leckhampton, near Cheltenham. He also sends a carefully-prepared sketch map showing the present condition of the line and its surroundings, which is reproduced on this page. Mr. Klapper writes: "The Leckhampton line runs from the stone works near the Leckhampton terminus of the Cheltenham & District Light Railway, up two steep inclines to the quarries of Leckhampton Quarries, Limited, and a further line, now disused, climbs the face of the escarpment and continues across the top of Leckhampton Hill for about a ¼-mile to some sand and stone workings. The rails are in short lengths, made of angle iron. Each section is screwed down to the end of a square timber, which is driven into the ground like a pile—to what depth I had no means of telling, as my visits to the line were unfortunately after work had ceased for the day, when nobody knowing details of the track could be seen. The gauge seems to be 3 ft. 6 in. The wagons are about 5 ft. in length, with bodies the width of the track. The wheels are flangeless, of course, and appear very thin and weak compared with the loads of oolite they are called upon to convey. The more or less level sections of the line are operated by horse-power, but the inclines are worked manually by windlasses and steel chains. The descending load is apparently intended to haul up empty wagons on most of them, and for this purpose double track only continues a little below half-way down each of these. About 10 wagons were seen altogether, including three lying derelict in the end of the level line on top of the hill."

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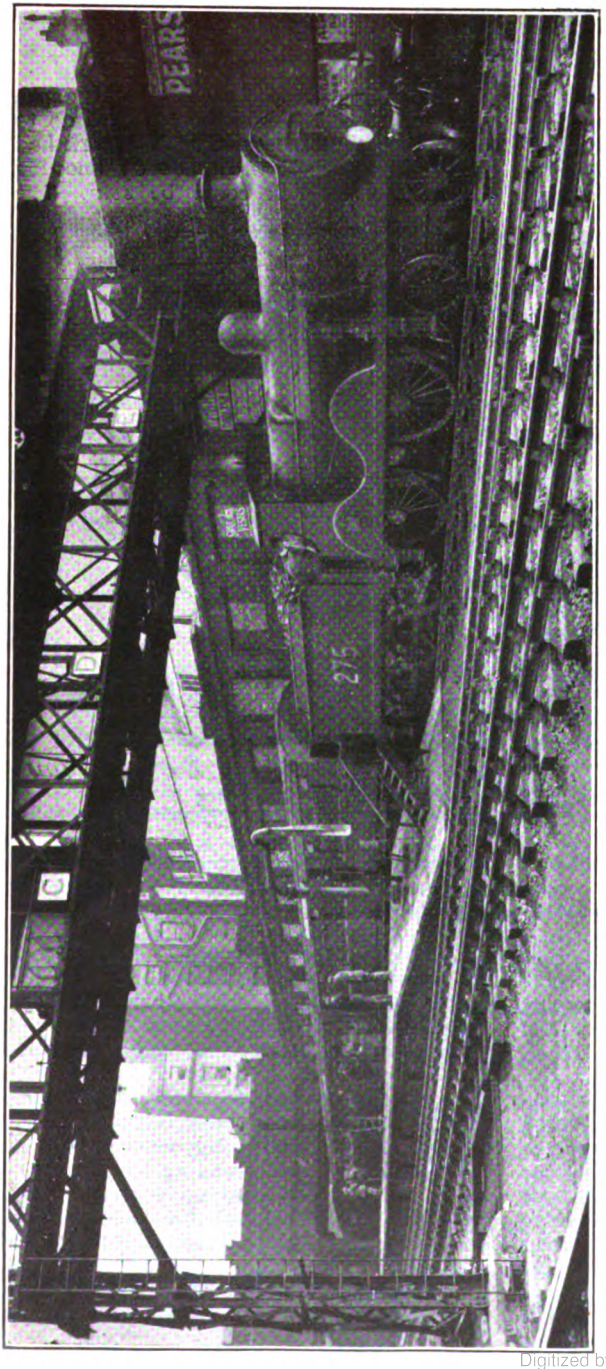
New Rolling-Stock, South Eastern and Chatham Railway.

AN article in the October RAILWAY MAGAZINE described the new corridor rolling-stock designed by Mr. R. E. L. Maunsell, for use in the Continental boat expresses and to permit of connection with the Pullman cars for the supply of meals and light refreshments. In response to requests from readers the following further particulars may now be given, while a view of one of the trains composed of the new vehicles, leaving Victoria Station, is reproduced herewith. All vehicles are 62 ft. long over body, 8 ft. 2 in. wide over the eaves of the roof, and the height above rails is 12 ft. 2 in. on the centre line of the roofs. Bogie centres are 44 ft. apart and bogie wheelbase is 8 ft. First-class corridor carriages weigh 31 tons 14 cwt. 2 qrs., and seat 24 passengers in six compartments, lavatories being provided at each end, also cupboards for tables and crockery. First-class brake composites weigh 30 tons 9 cwt. 2 qrs. and seat 16 passengers in four compartments, and four others in a small saloon, the guard's and luggage section being 11 ft. 6½ in. long. Second-class corridor carriages weigh 31 tons 8 cwt., and seat 42 passengers in seven compartments, lavatories, &c., being again provided at each end. The second-class brake carriages weigh 30 tons 9 cwt., and seat 36 passengers in six compartments.



BOAT TRAIN COMPOSED OF NEW STOCK LEAVING VICTORIA, SOUTH EASTERN & CHATHAM RAILWAY.

Railway Staff Statistics.

A RETURN has been issued showing the number of persons employed by railway companies in the United Kingdom on the basis of conditions in March last. The figures given afford much food for thought, especially when compared with those of the last complete return available, dated December, 1913. Under most headings the increases are considerable, while the final result is an increase of no fewer than 124,036 persons, a percentage of 19·4. The traffic-operating grades include noticeable additions, particularly in regard to engine drivers and motormen, firemen, engine cleaners, guards and shunters, in which connection the effect of the eight-hour day is peculiarly noticeable, for that alone can explain why increases in these grades reach such high percentages.

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Supervising, general labouring, and some of the smaller grades are, however, reduced, as well as some sections of the engineering staff. In the workshops there is a large increase in the number of mechanics and artisans, and the miscellaneous total reaches quite a formidable figure, being stated at no less than 92,370 on March 31 as compared with 37,605 in 1913. To some extent comparisons of the numbers employed in individual grades are vitiated by re-grading and by the influences of the general eight-hour day, but the percentage increase in total staff will occasion grave misgivings, seeing that it is reflected in the wages bill beyond the increase due to the generous additions to rates of pay, and is certainly not balanced by corresponding increases in traffic volume and gross receipts.

Numbers of Employees, 1913-1921.

IN the case of a few of the leading railways the following statistics may be noted :—

	December, 1913.	March, 1921.
England and Wales—		
Great Central	31,588	36,378
Great Eastern ..	33,014	44,602
Great Northern ..	34,523	38,190
Great Western	79,912	91,985
Lancashire and Yorkshire	39,407	45,388
London and North Western	87,948	101,483
London and South Western	24,091	31,247
London, Brighton and South Coast ..	15,585	18,285
Midland	71,193	81,731
North Eastern	55,872	65,048
South Eastern and Chatham	22,456	27,017
Scotland—		
Caledonian	23,354	29,316
Glasgow and South Western	9,735	12,142
Great North of Scotland	2,518	3,528
Highland	2,711	3,490
North British	25,205	31,869
Ireland—		
Great Northern ..	5,365	6,969
Great Southern and Western	8,611	10,197
Midland Great Western	3,329	4,253
Northern Counties Committee	2,625	2,765
Dublin and South Eastern	1,316	1,657

Most of the Welsh companies show very big increases, and the reason for this is not obvious; they are probably due to local changes and influences. For instance, while the Taff Vale increase from 4,814 to 5,690 appears reasonable, the Barry increase from 1,663 to 4,206 requires further explanation, especially as there are corresponding or even greater proportional increases on the Alexandra Docks and Cardiff Railways.

The London Electric also shows a very big increase, from 2,751 to 6,582.

On the other hand, the Rhondda and Swansea Bay Railway reduces from 616 to 324, presumably due to rearrangements of working with the Great Western Company. A few lines record a reduction of staff, including the Hull and Barnsley, Metropolitan, Londonderry and Lough Swilly, and under the miscellaneous heading for England and Wales and Scotland, but not for Ireland.

How the Grades are Distributed.

ANALYSIS of the various grades includes some interesting figures. The following are instances where totals in 1921 require to be expressed in five figures, whether increased or decreased :

	December, 1913.	March, 1921.
Carters and vanguards ..	25,509	17,769
Checkers	10,292	13,257
Clerks	75,900	93,373
Engine cleaners	19,074	21,203
Engine drivers and motormen	29,695	38,665
Firemen	27,177	37,097
Goods guards	16,588	18,435
Labourers	53,658	47,161
Mechanics and artisans ..	88,854	118,444
Permanent way men ..	71,593	74,510
Porters, goods	29,706	24,897
,, passenger	30,856	35,553
Shunters	14,869	19,543
Signalmen	29,467	31,952

As already indicated, a degree of re-grading and other influences renders some of the comparisons not quite correct, but the overall result, an increase of 19·4 per cent., especially as it is unevenly distributed, cannot be viewed with equanimity.

Locomotive and Train Working on the Highland Railway.

THAT very keen interest is taken by a large section of readers in the Highland Railway is shown by the number of letters received following upon Mr. Ahron's articles recently concluded. Major A. R. Munro, now of Edinburgh, but until 1914 closely acquainted with the Highland Railway, writes as follows :—" (1) In the list of the 'Clyde-built' engines on page 168, September RAILWAY MAGAZINE, it should be mentioned that No. 83 was afterwards renamed *Monkland*. (It was still running with that name on the duplicate list last February.) (2) Under the photo. of No. 15 on page 169, the date of the building is given as 1901, whereas my records show it as built in 1900. (3) On page 171 the letters A.M. and P.M. have been misplaced in several cases. The 3.5 and 3.50 trains from Inverness to Perth

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were afternoon runs, reaching Perth at 7 p.m., as stated in the second last line of page 169; while the 8.40 from Wick was a morning train connecting with the same trains at Inverness."

Major Munro also sends a description of recent experiences on the Highland and other Scottish railways which we hope to refer to in due course.

Mr. H. Gordon-Cumming writes:—"I might perhaps add that Mr. Stroudley had all his goods engines painted a uniform dark olive green instead of the ochre yellow adopted for passenger engines; which policy he continued in the case of his Brighton engines; also with regard to his brass number-plates, referred to on page 167, their background was also blue on all the Highland engines during his *regime*, the change, first to the same ochre-yellow as the rest of the engine, and afterwards to red, being instituted by his successor, Mr. D. Jones. The 4-4-0 passenger engine, No. 83, *Cadboll*, mentioned in the list on page 168, was afterwards re-named *Monkland*, but in what year I am unable to say offhand."

Catch Points and Buffer Stops.

IN the June RAILWAY MAGAZINE a series of tests conducted by the Great Western Railway were described and illustrated. As a result of these, various recommendations have been put forward, which may be summarised as follows:—

The utility of deflecting (or turn-off) rails has been proved in many cases, but their effectiveness entirely depends upon the speed at which the derailed vehicle is travelling, and upon the angle at which they are fixed. The opinion is expressed that where existing arrangements meet requirements, although they may not entirely agree with the recommendations of the Committee, they may be allowed to remain. But at places where vehicles are likely to attain a high speed and be turned towards the running line after derailment, the turn-off rail should be removed, after being jointly reported upon by the Divisional Engineer, Divisional Superintendent and Divisional Locomotive Superintendent concerned. Where a turn-off rail has been fixed at a not sufficiently acute angle the Divisional Engineer should remove it, the lay-out in other respects being completed in accordance with subsequent recommendations.

Conditions to be met.

IN deciding the class of catch point to be provided at a connection between a siding or avoiding line and a passenger running line, in cases where an engine, vehicle or vehicles, after derailment, would normally take a course parallel to the running line, it is recommended that the following general principles should be adhered to as far as possible:—

(1) Where the speed would be very low in normal circumstances, *e.g.*, from a short siding holding a small number of vehicles only, or where movement commences close to catch point.—Single-tongue catch point, without deflecting rail (B).

(2) Where a moderate speed only can be attained.—Single-tongue catch point, with deflecting rail of new standard pattern (A).

(3) Where high speed may be attained.—Double-tongue catch point, with inside rail and wood block (E).

(4) Where considered necessary owing to exceptional circumstances.—Double-tongue catch point (C) with crossing.

It is recommended that these principles be followed in all new work, and that information as to the particular type of catch point to be provided be inserted on all plans of new works. The new standard catch points, &c., should be introduced in existing work during relaying operations. In cases where, at connections with running lines, two or more catch points are in existence, opportunity should be taken, when relaying, to substitute one catch point, common to both roads, at the fouling point in such a position as to ensure a derailed vehicle not reaching the running line.

The second case applies to conditions where a siding or loop enters a running line at a tangent, so that an engine or vehicle if derailed at the catch point is likely to continue its course towards the running line. In such cases some more adequate protection than that afforded by an ordinary single-tongue catch point is necessary, and it is recommended that the arrangements described in Nos. 3 or 4 above be provided, where they can be jointly recommended by the Divisional Engineer, Divisional Superintendent and Divisional Locomotive Superintendent.

In order to form a cushion for derailed vehicles and to retard their speed and protect the chairs and sleepers, it is recommended that the permanent way immediately beyond all catch points be covered with ballast to rail level, for not less than 150 ft. where practicable.

Further Tests.

IN continuation of the tests previously described, a further series of experiments was carried out with empty wagons, or groups of wagons, run through catch points of various types. The results of these further experiments showed that straddle points cannot be depended upon to derail satisfactorily, or to retard a vehicle or vehicles

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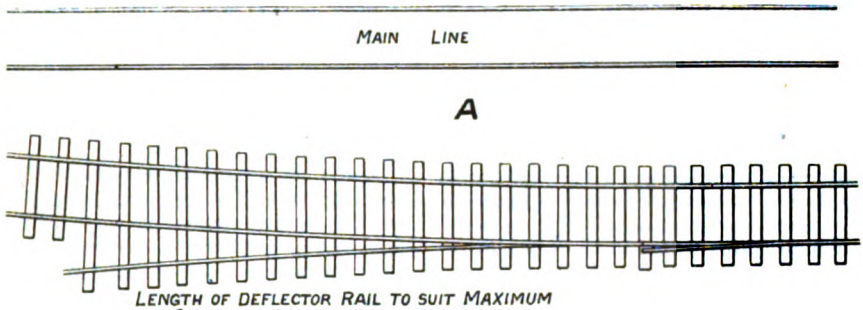
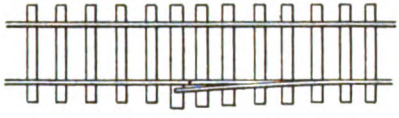
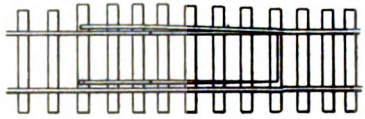
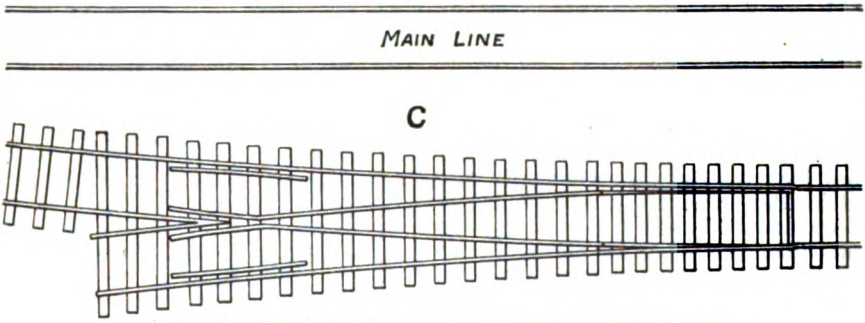
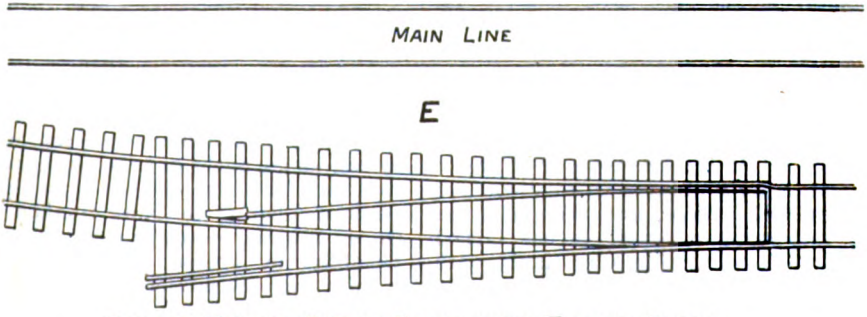

MAIN LINE
A
LENGTH OF DEFLECTOR RAIL TO SUIT MAXIMUM SPEED OF ENGINE OR VEHICLE.
SINGLE TONGUE CATCH POINT WITH DEFLECTOR RAIL.









TYPES OF CATCH POINTS (DIAGRAMS A, B, C, D & E), GREAT WESTERN RAILWAY.

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satisfactorily by the grinding of the flanges against the switch blades, and the Committee express the opinion that there is not sufficient advantage in this type of catch point. They therefore recommend that the few now in existence be taken out as opportunity arises, and replaced by the new standard pattern (D), with ballast brought to rail level beyond the short length of parallel rail. Where provided on a road between two passenger running lines, the catch points should be laid so as to throw off towards the adjacent line on which trains travel in the same direction. Where traffic on both the adjacent lines travels in the same direction the throw-off should be towards the less important line.

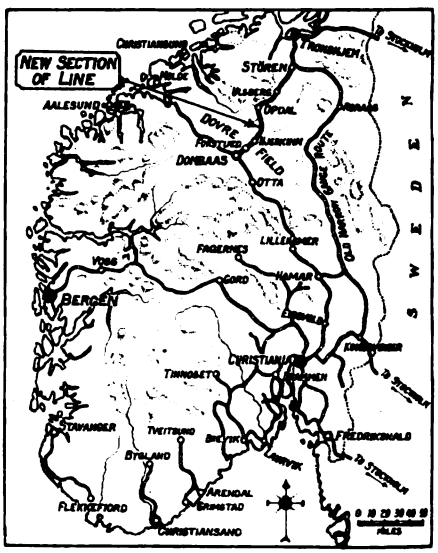
With regard to runaway catch points, it is recommended that they consist of a standard 14 ft. single-tongue catch point, placed at a distance outside the home signal for the ascending line, slightly greater than the length of the longest train running on the line; regard to be had to the nature of the site at which the throw-off would occur—except in special circumstances, as, for example, where tunnels or bridges intervene. Where practicable the permanent way to be ballasted to rail level for a distance of not less than 150 ft. behind the point of the tongue of the catch point.

It was stated by a representative of the Locomotive Department that the cost of buffer stops is now very high, exclusive of cost of fixing. The experiments previously described included the case where the road finished at the crossing and the engine or vehicle was derailed on to the ground, ashes (without rails) providing an effective stop without the expense entailed by the breakage of the standard type of stop-block. The Committee recommend that buffer stops at facing short dead-ends acting as traps in refuge sidings and goods avoiding lines or at other short sidings not used as shunting spurs be removed, and that the ground be made up to rail level, where practicable, for not less than 150 ft. beyond crossing, unless in exceptional cases a greater length is considered necessary.

Opening of the Dovre Railway, Norway.

NORWAY is by no means an easy country for the railway builder, and though it has several important railways, it has lacked a main route connecting Christiania with the northern parts. The first railway in Norway was that from Christiania to Eidsvold, built by Robert Stephenson in 1851–54. This was of 4-ft. 8½-in. gauge, and although other lines were built later in different parts, including many on the 3-ft. 6-in gauge, even in 1880 this had not extended further than Hamar, on Lake Mjösen, there connecting with a 3-ft. 6-in. gauge route, opened in 1877, thence to Trondhjem. Considerable traffic passed this way, but the route suffered somewhat in that its narrow gauge and light construction seriously restricted its capacity, while its location avoided the more central district adjacent to the old main road between South and North Norway.

A new central main line to reach Trondhjem was commenced in 1908 and is now completed. As far as Dombaas, railways already constructed are utilised. From Dombaas the new railway strikes across the mountains to join the old narrow-gauge route at Stören. Thence to Trondhjem, the latter section has been reconstructed to take both standard



MAP SHOWING THE DOVRE RAILWAY, NORWAY.

and narrow-gauge trains. The Dombaas-Stören line has, however, entailed heavy construction difficulties.

The Dovrebanen, as it is called, from the fact that it crosses the Dovre range, has involved many protective works against snow and avalanches, barriers and snow fences, long lengths of snow sheds and many tunnels. The new line was formally opened on September 17 by King Haakon and the Crown Prince, who came from Christiania to Dombaas by special train, there meeting a train from Trondhjem. At Hjerkinn, the highest point, Mr. C. T. Holtfodt, Director-General of the State Railways, described the construction of the line. The King then declared the line open, and public traffic was inaugurated on Monday, September 19. Unfortunately, the opening for public traffic was marred by a disastrous

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accident. On Saturday a returning special train from Trondhjem to Christiania, just before midnight came into collision, near Skansen, on the section between Stören and Trondhjem, when partly in a tunnel, with the last express from Christiania to Trondhjem by the old route. Six passengers were killed, including several Government notabilities, and many injured.

Institute of Transport.

ON Monday, October 10, the second annual dinner of the Institute of Transport (originally arranged for April 26 last, but postponed on account of the coal strike), was held at the Hotel Cecil, some 240 members and guests assembling under the chairmanship of the President, the Right Hon. Lord Ashfield of Southwell, who was supported by Sir Henry P. Maybury, K.C.M.G., C.B., President-elect; Sir Henry W. Thornton, K.B.E., General Manager, Great Eastern Railway; Mr. F. Tatlow, C.B.E., General Manager, Midland Railway; Mr. H. E. Blain, C.B.E., Hon. Secretary, and many other leading personalities in the transport world. Among other railway officers present may be mentioned :— Furness Railway: Mr. L. Speakman; Great Central Railway, Messrs. A. F. Bound, W. G. P. Maclure and J. W. Smith; Great Eastern Railway, Mr. H. J. Prytherch, M.B.E.; Great Northern Railway, Messrs. E. H. Burrows, P. J. Dowsett and C. J. Selway, C.B.E.; Lancashire and Yorkshire Railway: Messrs. Ashton Davies, M.B.E., T. A. Kenyon, M.B.E., and T. W. Royle, M.B.E.; London and South Western Railway: Messrs. A. E. Newhook and W. J. Thorrowgood; London, Brighton and South Coast Railway: Mr. G. H. Dennis; Metropolitan Railway: Messrs. R. H. Selbie, C.B.E., and W. Holt; Midland Railway: Messrs. W. N. Bancroft, E. Falconer, J. H. Follows, C.B.E., E. H. Hackwood, H. F. Loney, O.B.E., and J. Pepper; South Eastern and Chatham Railway: Messrs R. E. L. Maunsell, C.B.E., and E. C. Cox, C.B.E.; "Underground": Messrs. W. A. Agnew, A. R. Cooper, Z. E. Knapp, C. S. Louch, J. C. Mitchell, G. J. Shave, J. P. Thomas, J. Thornton, S. T. Trigg and S. J. Webb. The guests included Mr. Arthur Neal, M.P., Parliamentary Secretary, Ministry of Transport; Mr. E. Honoratus Lloyd, K.C.; the Lord Mayor of Manchester (Alderman W. Kay); Sir W. Marwood, K.C.B., Ministry of Transport, and others.

Following the usual loyal toasts, Mr. Arthur Neal proposed the health of "The Institute of Transport." He pointed out that the Institute is three months younger than the Ministry of Transport, and referred to the services rendered by Sir Eric Geddes, first Minister of Transport, and the first President of the Institute of Transport, and to the active support given by Lord Ashfield towards the formation of the Institute. He emphasised the importance of transport, and he was glad to note that the Institute had made so great progress during its, as yet, short lifetime. Sympathetic mention was made of the death of Sir Gilbert Claughton, one of the speakers at last year's dinner. Mr. Neal expressed the dictum that a strong transport world is essential to a strong industrial world. In reply, Lord Ashfield thanked Mr. Neal for his kind remarks, and coupled with his appreciation of the strong progress made by the Institute—the youngest among the great Institutions—he mentioned the valuable services rendered by the Council, and especially by Mr. H. E. Blain, hon. secretary. The membership is now over 1,000, and there are some 300 graduates and students. Hitherto, the Institute has suffered by the absence of suitable headquarters premises, but, through the good offices of Sir James Devonshire, arrangements have been made for the use of part of the premises of the Institution of Electrical Engineers.

Lord Ashfield on the Railway Situation.

REVIEWING the crucial and difficult times through which the railways are passing, Lord Ashfield pointed out that, whereas an ordinary business concern, if it cannot pay its way, is able to close its doors, this is not possible in the case of railways. Quoting a few statistics, Lord Ashfield pointed out that, whereas in 1913 the gross railway receipts were approximately £135,000,000, and during the 12 months ending June, 1921, they had increased to £254,000,000 (an increase of £119,000,000), expenditure had risen from £88,000,000 to £270,000,000 (an increase of more than £180,000,000). Ordinary passenger traffic has, however, increased only about 30 per cent., though the increase in the case of season tickets is 75 per cent. Freight traffic had in 1920 decreased 39 per cent., and for the first half of 1921 was 46 per cent. under the 1920 figures, and nearly 50 per cent. below those of 1913. The extreme conditions this year are, of course, due to the coal strike, but allowing for a slight fall in operating costs and in wages, he estimated that at the end of this year railway operating costs will be about £240,000,000, gross receipts being barely sufficient to pay working expenses, with little or no provision for an adequate return on invested capital. He hoped great things from grouping, electrification and other probable developments, but railway officers had a difficult task before them. Interesting remarks followed in regard to

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road traction, and Lord Ashfield anticipated that railways and roads would require to work in close co-operation, and suggested that we may yet see motor roads alongside railways, on which traffic may move in road trains, and possibly underground motor roads parallelling the underground railways.

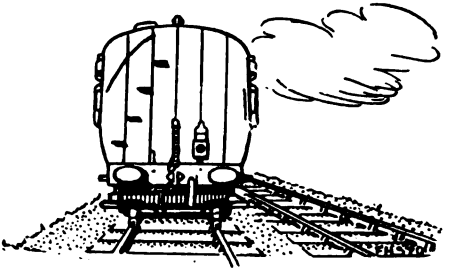
Mr. E. Honoratus Lloyd, K.C., proposed the health of "The Transport Industry," his remarks reviewing the great changes which the last 50–100 years have witnessed, with particular reference to tramways, light railways and omnibuses.

Biblical Transport.

SIR HENRY W. THORNTON, K.B.E., responded, causing some amusement by challenging Mr. Honoratus Lloyd's suggestion that transport is a modern development by pointing out that the "first personally conducted excursion was organised by the late Mr. Moses," and the "first great movement of livestock in bulk was carried out under the auspices of the late Mr. Noah." Dealing with modern times, Sir Henry pointed out that transport is the basis of industry. All business is based upon the exchange of commodities, and without efficient transport there can be no business. Transport is the handmaiden of commerce, but capital and labour are equally essential and must work together. The first charge upon gross receipts must be the wages of the staff, but capital has fared badly of late though labour has fared well. Railways are equally responsible to both. He had no quarrel with railway wages as such, but he thought the time has come when those who conduct railways have a right to demand eight hours' work for eight hours' pay. On railways, however, there are many instances where it is impossible to get more than, say, five hours' work within a period of eight hours, and this is one of the great difficulties. In regard to the Railways Act, as to which opinions differ, he regarded it as a measure which should provide a solution of the railway problem, but if it is assumed that unsatisfactory results only will follow, it must eventually cause difficulty and possibly pave the way to nationalisation. He pointed out that the four grouped railway companies to be constituted will be the largest single undertakings in the United Kingdom. Sir Henry P. Maybury, President-elect, proposed the health of "Kindred Institutions," to which Capt. H. Riall Sankey, C.B., C.B.E., President of the Institution of Mechanical Engineers, and Mr. J. S. Highfield, President of the Institution of Electrical Engineers, responded. Mr. E. S. Shrapnell-Smith, C.B.E., proposed the toast of "Our Guests," to which Major-Gen. Sir F. H. Sykes, G.B.E. K.C.B., C.M.G., Director-General of Civil Aviation, replied.

A 201-car Train.

REFERENCES to 75 and 100-car trains on the Norfolk and Western and Virginian Railways, V.S.G., have caused a correspondent of an American contemporary to mention a trial run on the New York, New Haven and Hartford Railway in November, 1914, when no fewer than 201 cars (of ordinary types) were operated in a single train. This was run from New Haven to Harlem River, and was made up largely of empty cars; but even with empties a train over 8,000 ft. long is something of an event (201 cars, estimated average length 40 ft.). This train was made up at New Haven and it consisted of 197 empties and four loads, with a caboose. It weighed 3,962 (short) tons, and was drawn by three large locomotives. From Bridgeport to Rye, 32 miles, it was run without a stop. There are on this section some upgrade sections of about 30 ft. per mile, but none of these is over about 1 mile long. Just beyond Rye the coupling parted behind the 135th car and the train was stopped, with the locomotives west of Mamaroneck. The hind end was back near Harrison, "making an unusual spectacle for the natives." It was deemed best not to risk the delay of coupling up, and so the engines, with the 135 cars, went on to Harlem River. The 66 cars constituting the rear part of the train were taken through to Harlem River by another locomotive.



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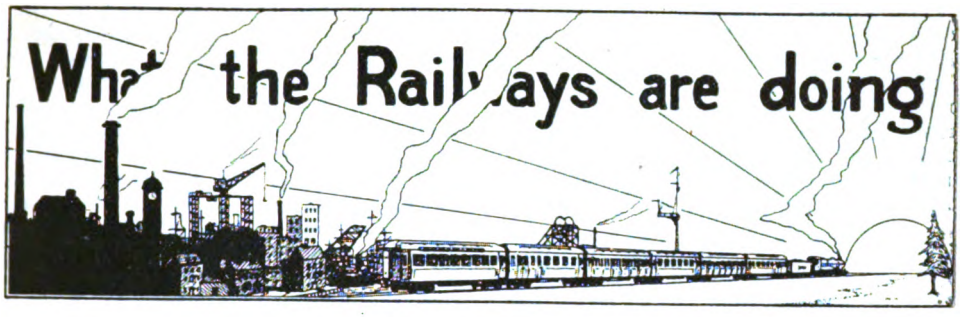

We record with regret the death, which occurred suddenly at Bude, of Mr. S. B. Saunders, formerly Estate Agent of the London & South Western Railway. Mr. Saunders' career with the company covered a period of 42 years. He commenced in the Estate and Rating Department in 1875 as Surveying Clerk, and was promoted to Chief Survey Clerk in 1888, which position he held until 1902, when he was appointed as Estate Agent, holding this office until his retirement in December, 1917. He enjoyed the fullest confidence of the directors and esteem of his fellow officials.

* * *

Sir Francis Dunnell, K.C.B., has resigned the post of secretary and solicitor to the Ministry of Transport and has returned to York to resume his position as secretary and solicitor to the North Eastern Railway. During the war Sir Francis Dunnell acted as additional assistant secretary to the Board of Admiralty and as secretary to the Cabinet organisation under Sir Eric Geddes charged with control and regulation of demobilisation. On the creation of the Ministry of Transport the directors of the North Eastern Railway consented to his temporary transfer to the Ministry for the period of control which has now come to an end

THE LATE MR. S. B. SAUNDERS,

Formerly Estate Agent,
London & South Western Railway.

* * *

When in 1915 the paramount importance of assisting in some practicable form our broken war heroes was evident to all Britishers, the noble scheme of the War Seal Foundation for providing permanent homes for our suffering comrades was launched by Sir Oswald Stoll, and the magnificent mansions now erected and tenanted at Fulham show how, in no half-hearted manner, the munificent sums contributed by Sir Oswald and supplemented by the public have been spent. The idea of enlisting the sympathies of railwaymen in assisting in this scheme was submitted to the various railway headquarters, and amongst others the London and North Western Railway gave every encouragement to the idea, with the result that a representative committee was soon formed with Mr. C. F. Graseman (Assistant to the General Manager) as chairman and Mr. F. Hare as secretary. Various schemes, including sale of war seals, a matinee concert at Euston, whist drives and concerts at all the principal towns on the London & North Western system, &c., were vigorously arranged with most encouraging success. The War Office kindly gave a large portion of debris from the Zeppelin brought down at Billericay, and the Mayor of Verdun forwarded a number of acorns and chestnuts gathered either in the town or its precincts during the bombardment of that historic town, and the sale of these and of articles made from the Zeppelin wreckage added considerably to the fund, which by July 31, 1921, reached the magnificent sum

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of £11,031 11s. It has now been decided to close the London and North Western section of the fund, and on Thursday, September 15, a cheque and securities representing the above amount was handed over by Mr. Arthur Watson, General Manager of the London and North Western Railway, to Mr. Wm. J. Roberts (representing Sir Oswald Stoll) of the War Seal Foundation.

* * *

OF the men employed in the London and North Western Railway Goods Department (South Staffordshire District), 606 joined the Colours and served in the Great War. Sixty-eight of this number never returned, having been killed in action or died of wounds, &c. To perpetuate their memory a brass tablet in an oak frame, containing the names of the fallen, and the inscription, "They died that we might live," has been purchased by the staff and erected at the entrance to the District Goods Manager's office, Queen Street, Wolverhampton.

* * *

THE Great Eastern Railway Golfing Society, which is open to the members of all grades of the staff, and includes in its membership directors, general manager, the principal officers of the company, clerks, porters, guards, &c., held its first autumn meeting on Saturday, October 8. In perfect weather about 50 members, including Mr. H. T. Bailey and Colonel Galloway, directors of the company, and Sir Henry Thornton, General Manager, travelled to the excellent sporting 18-hole course at Thornden Park, Brentwood, the use of which had been very kindly given to the Society for the day. The visitors also were made free of the club house of the stately old mansion belonging to the Petre family. The programme for the day included senior and junior bogey competitions, the former resulting in a 2 down tie between Messrs. G. Amos, fireman, stationed at Colchester, handicap 5, and F. C. Colson, General Manager's office, handicap 10. Mr. J. Lockes (Commercial Department), handicap 20, won the junior competition with 3 up, the second prize going to Mr. H. A. Stone (Commercial Department), handicap 20 with 1 up. The prizes for these events were given by Colonel Galloway and Mr. C. Busk, the Continental Traffic Manager.

GREAT EASTERN RAILWAY GOLFING SOCIETY.

Back row—left to right—Lieut.-Colonel Mauldin, Mr. Connor, Capt. Warren, Messrs. Edwards, Hawkins, Vale, Murphy, Bailey, Stone and Locks.

Middle row—left to right—Messrs. Evans, Keary, Jarvis, Bird, A. P. Parker, C. P. Parker and Miller.

Front row—left to right—Messrs. Thurston, H. T. Bailey, Sir Henry Thornton, Colonel William Johnson Galloway, Messrs. Parnwell and Syder.

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On a recent Saturday afternoon the South Eastern & Chatham Railway Swimming Club held their Eighteenth Annual "Bonsor" Cup Half-mile Race in the Tunbridge Wells open-air bath. The "Bonsor" Challenge Cup was presented to the club by Mr. Cosmo Bonsor, the popular Chairman of the South Eastern & Chatham Managing Committee, in 1898, and has been keenly competed for every year since, except during the Great War, when the activities of the club were suspended. On this occasion 15 started, and, after a good race, H. Crompton (Locomotive Department, Bricklayers' Arms) won by about 10 yards, A. C. Eagle (Eastern District Superintendent's Office) being second, W. King (Locomotive Department, Bricklayers' Arms) third, and J. Parsons (Locomotive Department, Bricklayers' Arms) fourth. The officials were:—Starter: T. E. Keele; judges: Lieut.-Col. J. S. Wilson, O.B.E., F. Stringer and F. Miles. After the race about 50 members of the South Eastern & Chatham Railway Swimming Club sat down to tea under the chairmanship of Lieut-Col. Wilson, who congratulated the winner of the "Bonsor" Cup. He also referred to the success of the club in winning and holding for several seasons all the railway swimming championships open to the London railways. It was no small thing, he said, for the club to establish such a record, and he appealed to the members to bring along promising recruits to carry on the traditions of the club and help it to retain its high position in the railway swimming world. The success they had achieved was gratifying, and he was sure they would agree when he said they owed a great deal to the example and instruction of that fine swimmer and sportsman, Mr. W. S. Barnes (one of the Managing Committee's solicitors and for many years captain of the club), who had actively interested himself in the club during the last 25 years, and to the generous support accorded to the Club by the Chairman, directors and officers of the Managing Committee.

* * *

In the *Railway Gazette*, dated August 12, reference was made to a luncheon given by the chairman, directors and officers of the Great Western Railway to the employees' representatives on the Conciliation Boards. The Great Eastern Railway recently adopted a similar policy, which, in view of the necessity for officers and staff "getting together" is (as our railway staff contemporary the *Railway Review* puts it), "worth following." Official and other representatives met together in conference in the Cambridgeshire Room at the Liverpool Street Hotel, the General Manager, Sir Henry Thornton, K.B.E., presiding. Representatives of the railwaymen's unions were also invited, including Messrs. Cramp, Latham and Holmes. Messrs. J. H. Thomas, Bromley and Walkden being unable to be present, as they were then occupied in negotiations regarding the Irish railways. Sir Henry Thornton explained that the gathering had been convened because he believed that the only way to get on with a large staff was to tell them frankly the difficulties the company had to face. Following the general manager's speech, several of the union representatives and others present discussed various matters. The meeting concluded with expressions of appreciation, indicating that the conference as a whole was regarded as a most satisfactory innovation and one which could only be productive of good.

* * *

Mr. Charles Colin Macrae, Chairman, London, Brighton & South Coast Railway, accompanied by Lord Henry Nevill (Deputy-Chairman), Mr. Gerald Loder, Mr. Charles J. Lucas, Mr. Charles L. Morgan, Sir Robert Turnbull, M.V.O., Mr. F. Dudley Docker, C.B. (directors), Sir William Forbes (General Manager), Mr. J. J. Brewer (Secretary), and other officers, unveiled on October 5 a memorial erected at London Bridge to the honour and in memory of those members of the company's staff who fell in the late war. Mr. Macrae, in addressing the members of the staff and many relatives of the fallen who were present, said that on this memorial were inscribed the names of 530 of their fellow-workers in the Brighton Railway Company who gave their lives in the service of their country in the great war, and thereby, with the further sacrifice of the lives of a multitude of other men as loyal as they, preserved this country from the greatest peril which had ever threatened her since the days of the Spanish Armada. So long as this imperishable bronze retained these names might they be a constant reminder of their noble sacrifice and an incentive to live up to their pattern and be loyal and worthy citizens of this dear country.

* * *

Among the recent activities of the Institution of Locomotive Inspectors and Foremen has been a paper read at Victoria by Mr. H. Holcroft, entitled "Tractive Force Applied to the Working of Trains." On Saturday, October 10, the members visited Derby, and after inspecting the works in the morning, were favoured in the afternoon with a paper by Sir Henry Fowler on "Combustion in Fireboxes."

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On this page is illustrated the distribution of prizes and certificates awarded to the successful students of the Lancashire & Yorkshire Railway School of Signalling in connection with the 1920–21 session, which recently took place at Manchester. Mr. Ashton Davies, M.B.E., Superintendent of the Line, presided, and Mr. E. B. Fielden, Chairman of the Company, presented the awards. The number of students attending the examination at the end of the 1920–21 session was the " record " one of 374, this being a marked improvement upon any year since 1912, and in excess of the previous " record " of 356 for 1911. The number of students passed was also a record one of 337 (a percentage of 90·11), and whilst the highest since 1917, fell below the figures for 1912 and 1915, when over 95 per cent. of the candidates passed. For the whole series of examinations held since May, 1910, the total number of students examined is 2,659, the number of students passed 2,378 (or 89·43 per cent.), this being a very satisfactory result and one fully justifying the railway company's enterprise. Of the successful students since the introduction of the examinations, 632 have been awarded first-class certificates, 1,079 second-class, and 667 third-class. Mr. G. Leather, who this year has obtained the maximum number of marks in the Honours Division, is only 19 years of age. He commenced his studies at the school of signalling in the session 1917–18, and has continued at each subsequent session.

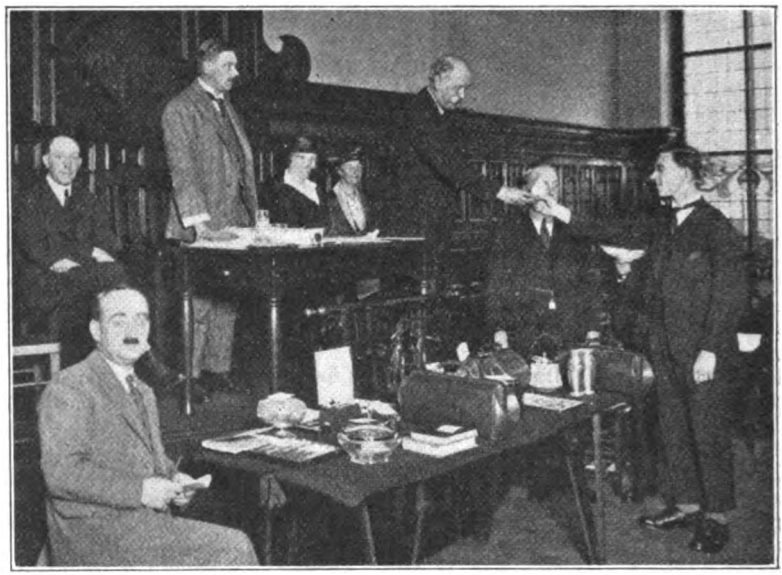
* * *

Institute of Transport.—The following are the officers for the year ending September 30, 1922 :—*Honorary President*: The Rt. Hon. Lord Ashfield, of Southwell. *President*: Sir Henry Maybury, K.C.M.G., C.B. *Past President*: The Rt. Hon. Sir Eric Geddes, G.C.B., G.B.E., M.P. *Vice-Presidents*: Sir Joseph G. Broodbank, Sir Sam Fay, Sir Maurice Fitzmaurice, C.M.G., H. H. Gordon, L.C.C., Sir Lyndon Macassey, K.B.E., K.C.; E. S. Shrapnell-Smith, C.B.E. *Hon. Treasurer*: Sir Philip Nash, K.C.M.G., C.B. *Hon. Solicitor*: Sir William Joynson-Hicks, Bart., M.P. *Hon. Secretary*: H. E. Blain, C.B.E.

The following awards have been made in respect of the years 1919-20 and 1920-21 :—

Railway Gold Medals :—Operating : Arthur Watson, C.B.E., M.Inst.T., General Manager, London and North Western and Lancashire and Yorkshire Railways, for paper on " Some Advantages of Control as applied to traffic on Railways." Engineering : William George Bishop, M.Inst.T., Superintendent (Mechanical), South African Railways, for paper on " Locomotive Shed Practice of the South African Railways."

Road Transport Gold Medal :—Col. C. H. Bressey, O.B.E., M.Inst.T., Divisional En-



PRIZE DISTRIBUTION, L. & Y. SCHOOL OF SIGNALLING.

Mr. G. Leather receiving first prize from Mr. E. B. Fielden (Chairman).

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gineer, Roads Branch, Ministry of Transport, for paper on "History of Roads, Constructional Requirements from the User Point of View, Systems of Control and Taxation of Road-User."

Aerial Transport Gold Medal:—Maj.-Gen. Sir Frederick Hugh Sykes, G.B.E., K.C.B., C.M.G., Controller-General, Civil Aviation, for paper on "Aviation and Air Transport."

Graduate Medal:—William Frederick Steel, London and South Western Railway, for paper on "Potato Traffic from St. Malo to Southampton Docks."

Student Medal:—Carol Vaughan Miller, Great Eastern Railway, for paper on "Freight Train Loading in Relation to Economic Working."

"*Modern Transport*" *Premium*:—John Whitehead Parker, Lancashire and Yorkshire Railway, for paper on "The Use of Trays as a Means of Reducing Goods Handling."

The Council has consented to the formation in the Metropolitan area of a Graduate and Student Society, with objects as follows—(*a*) To assist in the promotion and encouragement of knowledge of traffic science and the art of transport in all its branches, and to establish social intercourse between members of the Society; (*b*) to hold meetings at which papers may be read and discussed, and to arrange visits to transport undertakings, works and other places of interest connected therewith. Applications for membership are invited and should be addressed to the hon. secretary of the Society, Mr. Alexander J. Webb at the offices of the Institute, 2 and 3, The Sanctuary, Westminster, S.W. 1.

* * *

LECTURES to graduates and students will be delivered at the Royal Society of Arts at 5 p.m. as follows:—November 18: "The Operation and Development of Urban Electric Railway Services," J. P. Thomas, Operating Manager, London Underground Railways. December 16: "The Operation of a Road Distributing Agency," J. Paterson, Deputy Managing Director, Carter, Paterson & Co., Limited. January 20, 1922: "The Operation of an Important Railway Goods Terminal," G. T. Hedge, O.B.E., Outdoor Goods Manager, London and South Western Railway. February 17: "The Operation of a Large Tramway Undertaking, with Reference to Capacity and Cost under given Conditions," J. M. McElroy, General Manager, Manchester Tramways Corporation. March 17: "The Operation of an Omnibus Company, with reference to Capacity and Cost under Given Conditions," F. Pick, Assistant Managing Director, Underground Railways and Omnibus Companies of London. April 21: "British and Foreign Canals and Waterways Compared," Col. J. A. Saner, Engineer and General Manager, Weaver Navigation Trustees. May 19: "The Operation of Heavy Suburban Passenger Services on a Steam Railway, with particular reference to density of Service, Terminal and other Facilities."—F. V. Russell, C.B.E., Superintendent of Operation, G.E.R.

* * *

PROGRAMME OF MEETINGS, SESSION 1921-22. Ordinary meetings will be held at the Institution of Civil Engineers at 5.30 p.m. as follows:—November 14: "Possibilities of Improving Train Loads," H. Kelway-Bamber, M.V.O., Leeds Forge Company, Limited, formerly East Indian Railway. December 12: "The Future of British Railways," Sir George Paish. January 9, 1922: "Transport Law," Sir Francis Dunnell, K.C.B., formerly Secretary and Solicitor, Ministry of Transport. February 13: "The Development of Commercial Airways," Sir Henry White-Smith, C.B.E., Director, Bristol Aeroplane Company, Limited. March 13: "Railway Problems in China and Australia," T. R. Johnson, M.Inst.C.E. April 10: "The Relation of Civil Engineering to Transport Problems," Sir Alexander Gibb, G.B.E., C.B., formerly Director-General of Civil Engineering, Ministry of Transport. May 8: "Recent Improvements in Equipment for Electric Traction on Railways, Making for Economy," Roger T. Smith, Electrical Engineer, Great Western Railway.

* * *

MR. E. H. WAYNE, of Leicester, points out that Mr. Malcolm Niven, as quoted on page 216 of the September RAILWAY MAGAZINE, is incorrect in his remarks comparing the old and new Great Northern Railway engines No. 477. The works number of 2-4-0 No. 811 was 477, and this presumably is the engine Mr. Niven had in mind. The number 477 was borne by a 0-6-0 goods engine built in 1867.

* * *

AN Edinburgh reader, Mr. T. M. S. Findlater, mentions that the following North British Railway locomotives have recently been rebuilt:—0-6-0—Nos. 180, 654, 713, 723, 745, 749, 750, 753, 757, 760, 773, 780 and 782; 4-4-0—Nos. 212 and 312; 4-4-2—Nos. 872, 874, 876 and 877; 4-4-2 (tank)—Nos. 26 and 135. New locomotives include: 0-6-0—Nos. 33, 98, 101, 103-5, 128, 143, 171, 175, 272, 273, 506, 507, 508, 517, and 518; 4-4-2 (tank)—Nos. 511 to 516; 4-4-2—No. 509, *Duke of Rothesay* and 510, *The Lord Provost*.

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MR. W. A. C. MCCONNELL, of Langside, Glasgow, states that of the new three-cylinder 4-6-0 locomotives designed by Mr. W. Pickersgill, C.B.E., for the Caledonian Railway, the first of which was illustrated as frontispiece to the October number of the RAILWAY MAGAZINE, Nos. 956 and 959 are at St. Rollox and Nos. 957 and 958 at Carlisle. A further series of superheated 4-4-0 engines are Nos. 72–91. There are now 76 engines of the "improved 140 class," the others being Nos. 140-150, 39-48, 923-927, 132-139, 113-124, and 928-937.

* * *

FROM Bath, Mr. L. B. Hewitt writes:—By a coincidence, Vol. 8 of the RAILWAY MAGAZINE contains two substantial contributions to the locomotive history of the Furness Railway, which it is of interest to recall, in view of Mr. E. L. Ahrons' articles dealing with the history of that line. The first feature of this volume is an illustrated interview with Mr. W. F. Pettigrew, the locomotive superintendent, containing a reference to the disappearance of a Furness Railway locomotive in a subsidence at Lindal on September 22, 1892. In an article dealing with the Weston and Clevedon Light Railway on pages 524 to 529, a reference is made to the two well tanks of the 2-2-2 type, referred to last month by Mr. Ahrons. According to this article, the two locomotives were Nos. 12A and 35 in the Furness Company's books. No. 12A was renamed *Clevedon* and No. 35 *Weston*.

* * *

WE are advised that although Mr. J. F. McLean's book on North Eastern Railway locomotives is out of print, and pending the production of a new up-to-date edition, a few copies are still available on application to the author, c/o. Messrs. R. Robinson & Co., Limited, Stationers, &c., Newcastle-on-Tyne.

* * *

MR. J. M. CLARK records a curious train formation, noticed at Blairgowrie, Caledonian Railway, owing to the running of an official inspection train in combination with an ordinary local train. 0-4-4 tank engine, No. 164, headed the train, with No. 1123 (the famous 4-2-2 "single" engine) behind, followed by the official saloon and the ordinary carriages behind. Presumably, this combination was adopted in order to avoid complicating single-line working. Mr. Clark also mentions four new engines of the "Clan" class now in service on the Highland Railway as follows: No. 54, *Clan Chattan*; No. 55, *Clan Mackinnon*; No. 56, *Clan Mackenzie*; and No. 57, *Clan Cameron*.

THE characteristic tender cabs have now been removed from several of the 2-8-0 mineral locomotives on the Somerset and Dorset Joint Railway.

* * *

MR. DAVID SMITH, of Dalmellington, Ayrshire, mentions that the following Glasgow and South Western 4-4-0 locomotives of Mr. Manson's design have been rebuilt by Mr. Whitelegg with larger boilers, as illustrated in the RAILWAY MAGAZINE, October, 1920:—Nos. 406–8, 411–2, 416, 425–6, 430, 434, 437–8, 444 and 446–7. Nos. 379 and 388 of the 240 class have also been similarly rebuilt. These engines form Class R, which includes the Nos. 18 and 240 classes, together with those already rebuilt. Nos. 351, 355 and 358, 4-4-0's with 5-ft. 9-in. wheels, have received larger boilers of the same type, and these are also fitted to some of the Manson goods engines, including Nos. 87, 102, 104, 106–7, 113, 125 and 130. Mr. Smith further mentions that 4-4-0 No. 416 regularly works the fast non-stop expresses between Ayr and Glasgow. No. 406 is a new engine of the same design as those now rebuilt. The four Stirling 0-4-4 tank engines, Nos. 728–731, have had their bunkers enlarged; No. 728 is at St. Enoch, 729 at Girvan, 730 at Dalmellington, and 731 at Ayr. No. 729 works the dining-car express via Turnberry. No. 703, of Mr. Smellie's 6-ft. "Greenock Bogie" class, has received a larger boiler.

* * *

A NEW series of London and North Western Railway 0–8–0 superheater goods engines will shortly be turned out at Crewe, as follows:—Nos. 485, 742, 253, 434, 1154, 215, 216, 220, 221 and 223. With the exception of a slightly increased boiler pressure, these engines are of similar dimensions to those previously built.

* * *

A FURTHER four "Prince of Wales" class locomotives have been received by the London and North Western Railway from Messrs. Beardmore & Co., and are at present in the works at Crewe for painting. They bear Nos. 224, 227, 232 and 237 (maker's Nos. 184–187.) These will be followed shortly by Nos. 239, 240, 241, 242, 243 and 244. No. 120 is the only one so far to be turned out, and is painted black, without lining. Of the same series, Nos. 123, 125, 129, 135, 140, 141, 142, 145 and 148 are also being painted black. The makers' numbers of these 10 engines are 174–183 inclusive, in the order given.

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OUR Crewe correspondent, Mr. C. Williams, further reports that No. 1120, *Thunderer*, a "Precursor" class 4–4–0, has been converted to superheater with extended smokebox, and is now similar to the "George V." class. The latest four-cylinder compound passenger engines to be converted to two-cylinder simple ("Renown" class) are:—"Jubilee" class: No. 1910, *Cavalier*, No. 1928, *Glatton*, and No. 1947, *Zillah*; "Alfred the Great" class: No. 1973, *Hood*. The following four-cylinder compound mineral engines have also been converted to two-cylinder simple, but in this case provided with superheaters:—Nos. 41, 1227 and 2208. Nos. 372, *Belgic* (late *Germanic*), and 956 *Bulldog* (late *Dachshund*) are now running with new nameplates, the old double ones having been dispensed with.

* * *

"A STORY of Railway Pioneers," by Major Snell, M.C. (ex-R.E.), will shortly be published by Messrs. Selwyn & Blount. The book, which contains many illustrations and plans, is a record of the activities of two early locomotive engineers—Isaac Dodds and his son, Thomas Weatherburn Dodds. The volume includes chapters on the Stephensons and James Hann.

* * *

MESSRS. ROBINSON BROTHERS, of Egham Hill, Surrey, send two specimen lantern slides, one reproducing a RAILWAY MAGAZINE frontispiece, designed to show the good results derived from their process for eliminating discoloration due to overheating and sweating. This work is done by a member of the firm, who has had long experience in lantern slide work.

* * *

A NEW cover design for its public timetables book has been adopted by the Caledonian Railway. Printed in blue, the cover carries a central monogram having letters in white on a circular red ground. The result is eminently satisfactory.

* * *

AN accident of a most unusual character happened to a passenger on the 7.30 p.m. express from Brighton to Victoria on Monday, September 5. Not far from Burgess Hill a heavy piece of iron crashed through the window of a compartment in which Mr. L. S. Price, a stockbroker, was seated, and penetrated his head inflicting severe injuries. The communication cord was pulled and the train stopped at Haywards Heath, where the guard and other railway employees gave every assistance. Mr. Price was taken to the Haywards Heath Cottage Hospital, but died without recovering consciousness. The cause of the accident is still a mystery, and the suggestion that the iron bar which inflicted the injury had become detached from the locomotive is conjectural.

* * *

AT Wigton, Cumberland, a young printworker was fined 50s. for assault. Through a small hole in the back of a railway carriage defendant saw some men playing cards. Pulling an iron rod from the window blind, he was angling through a hole to upset the stakes when a comrade struck his elbow. The rod was propelled into the compartment where, instead of scattering the money, it damaged a passenger's eye.

* * *

IN 1920 the directors of the Liverpool Overhead Railway placed a contract with the McKenzie, Holland and Westinghouse Power Signal Company, Limited—now associated with the Westinghouse Brake and Saxby Signal Company, Limited, 82, York Road, King's Cross, N. 1—for the re-signalling of their railway. This work has now been completed under the direction of Mr. E. J. Neachell, engineer and manager of the railway, having been brought into use on July 27 and inspected and passed by Major Hall, on behalf of the Ministry of Transport, on August 3. All signal indications are given by coloured lights, semaphore arms being dispensed with, the red and green lights ot the lamp signals being readily distinguishable, even in the brightest sunshine. The signals are controlled throughout by track-circuit, and train-stops of an improved pattern are attached to all the running signals.

* * *

IT is announced that the German railways are about to introduce third-class sleeping cars. Before the war the sleeping car supplementary charges in Germany were very much higher than those in Great Britain, and the sliding scale, based on distance, made the extra charge for distances comparable in the journey from London to Aberdeen from three to four times the fee the British traveller had to pay. Since the war all fares, rates and charges on the German railways have increased enormously, so that the third-class "sleeper" is not likely to be a particularly cheap affair. This innovation in Germany may result in a revival of the demand for similar facilities in Great Britain, a concession some Scottish members of Parliament, for a long course of years, have endeavoured to obtain. Already the RAILWAY MAGAZINE has received from a reader the following question:—

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"Could not some of the ambulance cars lying rusting in sidings, as at Southampton and Didcot, be reconditioned and turned into third-class sleeping cars for use to and from Scotland ? "

* * *

As an experiment the Great Western Railway has introduced a half-crown luncheon on about 30 restaurant cars working between London, the West of England, South Wales and Birkenhead. The 4s. five-course luncheon will still be served to those who desire it. The 2s. 6d. luncheon consists of hot or cold joint and vegetables and either sweets or cheese.

* * *

AN experimental through train conveying fruit from the South of France to London, via the Richborough ferry, arrived on October 11 at the Southwark *grande vitesse* depôt of the South Eastern & Chatham Railway at 2.26 p.m. Representatives of three French railways, the Société Centrale des Ferry-Boats, and the Port of Queenborough Development Company, travelled on the train, and were received at the London depôt by Mr. F. A. Brant, Continental Traffic Assistant to the General Manager, and Mr. Dennis, Continental Goods Traffic Manager. The consignment, about 125 tons in weight, and consisting of grapes, nuts, melons, &c., was brought over from France by train-ferry in 27 sealed goods wagons supplied by the South Eastern & Chatham Railway, and by special arrangement the Customs examination was deferred until the train reached London. The consignment included eight decorated baskets of grapes and pears, to be tendered to the King and Queen. The goods were collected in Paris and left there at 9.30 p.m. on Monday, October 10, reaching Calais at 3 a.m. on Tuesday. The ferry left Calais at 4.30 a.m. on Tuesday, October 11, and though the Channel was enveloped in thick mist, it arrived at Richborough at 7.30 a.m. The train, which was decorated with the French tricolour in celebration of the event, reached Southwark, as above stated, at 2 26 p.m.

* * *

QUITE a local sensation was witnessed between Beckenham Junction and Sydenham, when a special train ran, for the first time since the war, from the Chatham system to the Low Level Station at the Crystal Palace, and many people expressed the hope that the innovation might eventually lead, on special occasions at least, to the restoration of the old service from the Chatham line to the Palace.

* * *

SIR ERIC GEDDES, M.P., retired from the Ministry of Transport as from Saturday, October 15.

Photo.] LONDON AND NORTH WESTERN RAILWAY. [*G. W. Smith.*

Down West Coast express hauled by "Lazonby" (2-4-0) and "Queen Empress" (4-6-0).

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THE RAILWAY MAGAZINE.

METROPOLITAN RAILWAY.

Reconstructed Electric Locomotive Hauling Train of Seven Coaches between Baker Street and Harrow.

These locomotives are designed to give 1,400 h.p., and their rate of acceleration is such that within 25 seconds from a dead stop they can attain a speed of 25 miles per hour. The maximum speed of which they are capable is 65 miles per hour, and they can negotiate 3-chain curves. The maximum tractive effort is 22,000 lb.

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AN OLD PHOTOGRAPH (1874) OF HAVANT STATION, SHOWING HAYLING BRANCH TRAIN IN BAY PLATFORM.

The Hayling Railway.

By S.Y.K. and H.L.H.

HAYLING Island, lying close to the Hampshire coast, has for more than two centuries enjoyed a reputation as a watering-place. Prior to the advent of the railway, there was communication between the island and the mainland by means of a road bridge, 860 ft. long, which had been made by the then Duke of Norfolk, Lord of the Manor, in 1822–24. This bridge, on the north side, and the ferry at the western extremity, remained for many years the sole means of access to the mainland. The bridge was subsequently sold to Mr. Padwick, who took over the manorial rights of the island.

The London, Brighton and South Coast Railway was opened from Chichester to Havant and Portsmouth in 1847, and in the same year an Act was passed authorising the construction of a tramway from Hayling Bridge, along the causeway to Langston, and thence to Havant station; but owing to want of funds the matter was allowed to drop. By 1859 the London and South Western Railway had extended its line to Havant, at which station a junction was formed with the London, Brighton and South Coast Railway.

As two railways were now established within a short distance of the island, determined efforts were made by the local population to extend the iron road on to the island itself, and July 23, 1860, saw the passing of an Act authorising construction of the Hayling Railway. The railway was to commence at Havant and terminate at a point on the island near the west ferry on Sinah Common. The original intention was to carry the permanent way on an embankment outside the western shore of the island, in such a manner as to reclaim 1,000 acres of mud, and improve the channel of Langston Harbour. The bridge carrying the line from the mainland to the island was to be of open pile work, to the extent of 320 yards, and with an opening span for the accommodation of shipping.

Construction began in 1863, Mr. James Abernethy being the engineer, and Mr. Frederick Furness the contractor. On

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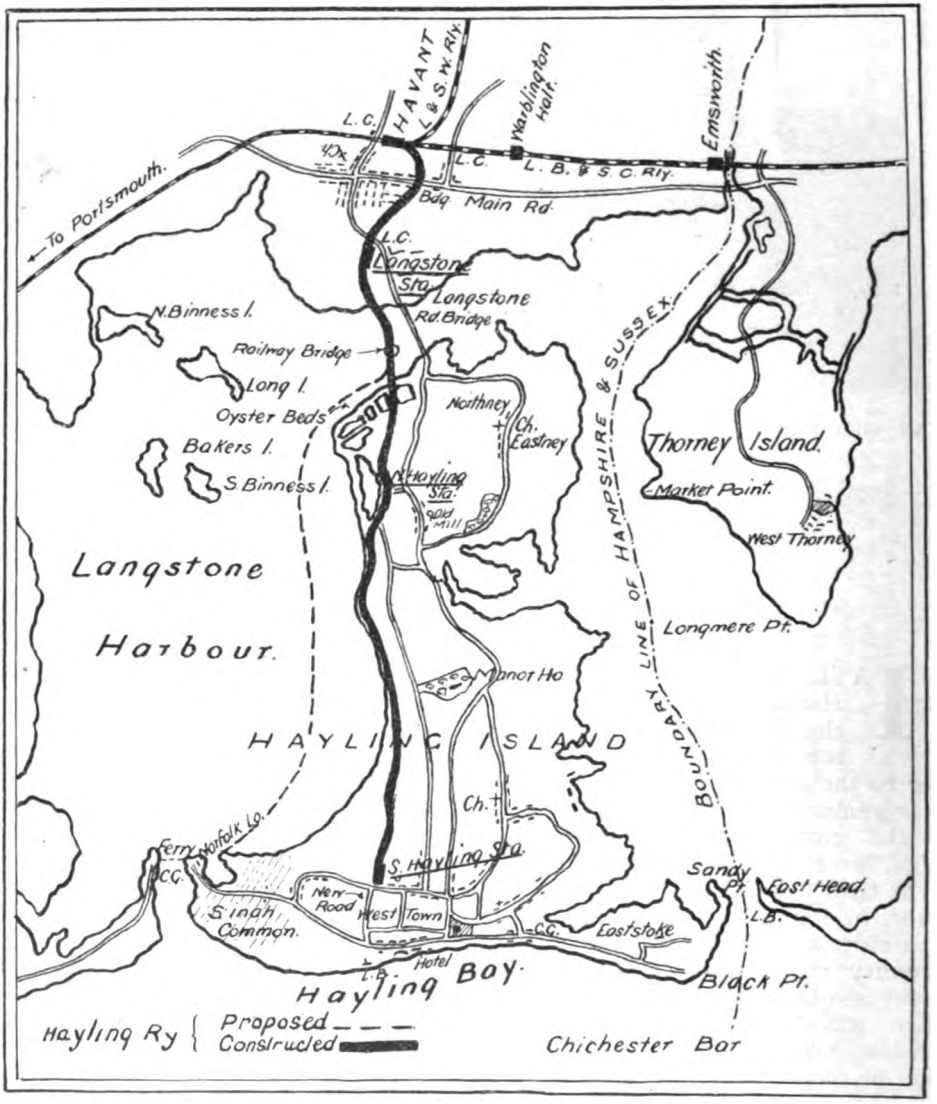
July 14, 1864, a further Act, styled the "Hayling Railway and Docks Act, 1864," was obtained for the purpose of extending the railway along the beach for 1¼ miles, and for making docks and a pier at Sinah Ferry; but this part of the project never

Nothing further appears to have been done until the appointment in 1866 of Mr. Francis Fuller as Chairman. Mr. Fuller was a land and estate agent of London, and had been attracted to the island by the condition of affairs following



MAP OF THE HAYLING RAILWAY.

materialised. In January, 1865, the line was opened from Havant to Langston for goods and mineral traffic, but by this time the rest of the works had been abandoned owing to the embankment being constantly washed away by the sea. Portions of this derelict work are still visible.

on the death of Mr. Padwick, Lord of the Manor. With the idea of popularising Hayling as a health resort, and making an imposing sea front there, Mr. Fuller negotiated for an extensive purchase of land, and for the completion of the railway as a primary necessity. The suspended

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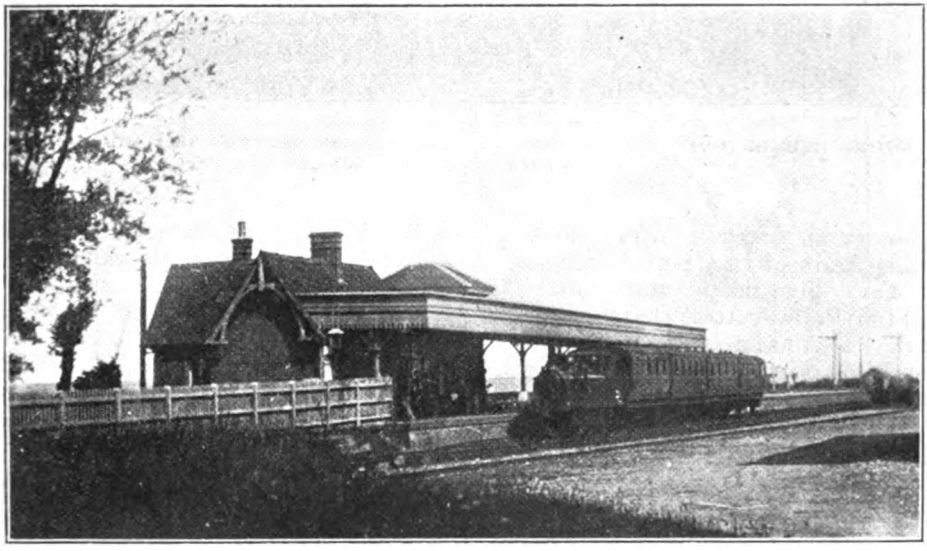
railway works had been exposed to the action of the sea for a long time, and added to this, an exhausted exchequer and divided counsels had brought the company to the end of its tether. Mr. Fuller proceeded to put matters on a more businesslike footing, and definitely abandoned the original idea of constructing the railway on a raised embankment beyond the shore. He also determined to place the southern terminus nearer to the south beach, instead of in the suggested position on Sinah Common, at the western extremity of the island. The diversion was authorised by Parliament in the session of 1867, but even before the Bill was passed the necessary land had been purchased. It was endeavoured to add to the attractions of Hayling by providing a racecourse on the Common, and inaugural meetings were held there on July 16 and 17, 1867.

Mr. Furness was again employed as the contractor, and made such good progress with the line that the first passenger train ran from Havant to South Hayling on June 28, 1867, the public opening taking place on July 16, the first day of the race meeting. The line was closed during the following winter, but reopened in the spring of 1868, with a service of five trains each way daily. Fifteen minutes was the time occupied on the journey, the trains not stopping at intermediate stations unless required. The railway was then worked by the contractor, who provided a 0-4-2 side tank engine, and some four-wheeled coaches, the latter being hired from the London and South Western Railway. There were three stations, their names and distances from Havant being as under :—

	m.	ch.
Langston	1	9
North Hayling	2	36
South Hayling	4	45

Langston and North Hayling stations were of somewhat primitive construction, but South Hayling terminus was more imposing, being built of brick and timber. The track was single, and originally formed of bridge pattern rails. These remained in use until 1889, when they were replaced by 58-lb. flat-bottomed rails. In 1899 the whole line was relaid with 78-lb. bull-headed rails, except that part over Langston bridge, which has flat-bottomed rails.

In January, 1872, an agreement was entered into with the London, Brighton and South Coast Railway, whereby a net rental of £2,000 per annum was secured to the Hayling Company, and from the date mentioned the Brighton Railway commenced to work the line with its own rolling-stock. The accompanying illustration of Havant station, reproduced from



BRANCH TRAIN AT HAYLING ISLAND STATION.

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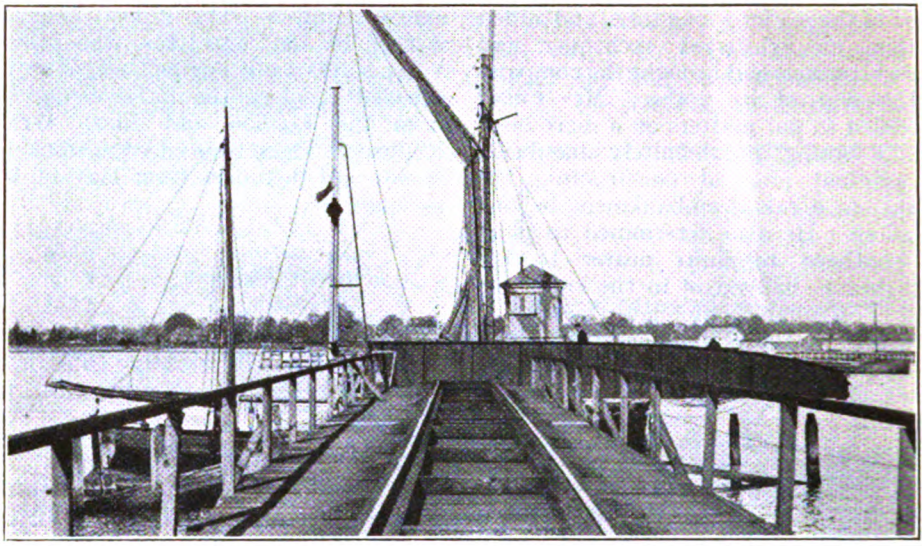
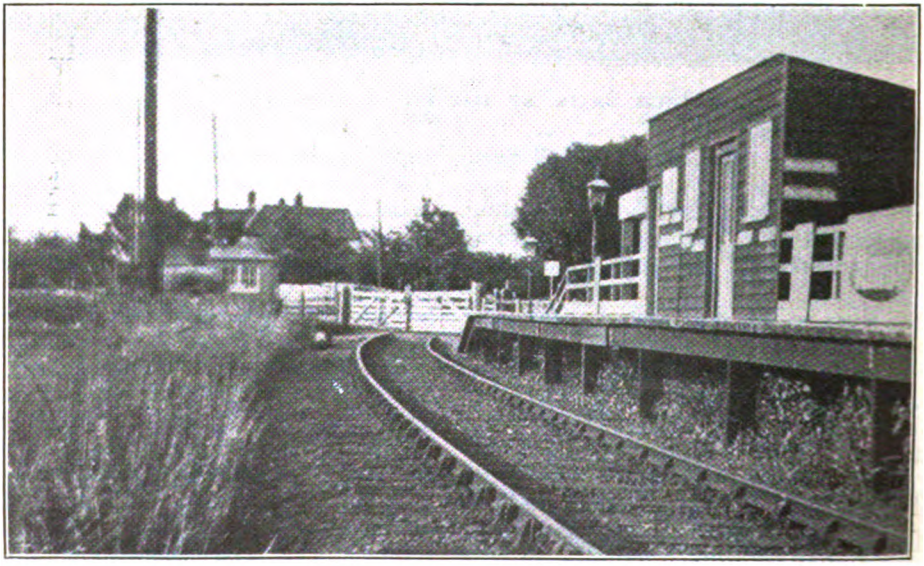


SWING BRIDGE (OPEN FOR A VESSEL TO PASS) CONNECTING HAYLING ISLAND WITH THE MAINLAND AT LANGSTON.

a photograph taken in 1874, shows the Hayling train of that period standing in the bay. For many years after the Brighton Railway took charge the small engine, appropriately named *Hayling Island*, was principally in evidence on the branch. Built by Sharp, Stewart & Co. in 1869, it was a 2-4-0 side tank, having 11 in. by 16 in. cylinders, and 4 ft. wheels. In the latter years of its existence, and until being broken up in 1899, it was running as a 2-4-2 engine, with saloon attached. It then bore the name *Inspector*.

During the great blizzard of January 18, 1881, snowdrifts of 10 ft. accumulated on



LANGSTON STATION.

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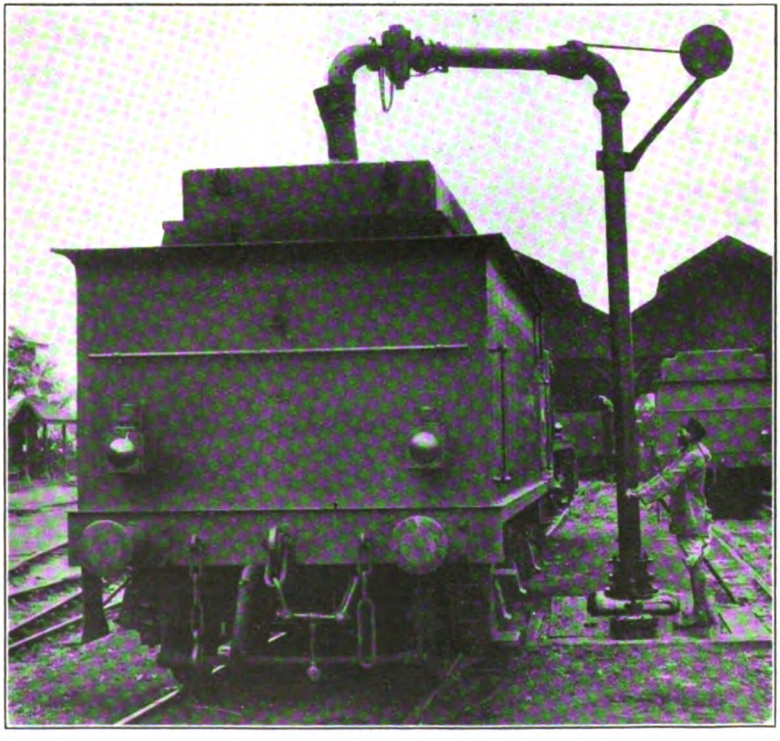
the Hayling line, and necessitated the suspension of trains for a week. Again, in September, 1883, the service was interrupted for a week owing to floods caused by a violent south-westerly gale.

South Hayling station was re-named Hayling Island about 25 years ago. Several alterations were made at this place between 1897 and 1900; the engine shed which previously existed being demolished in the former year, and the present bay line on the west side added a little later. Langston Swing Bridge was renewed in 1902-3.

To-day the service consists of 11 trains each way between Havant and Hayling Island, these being worked by 0-6-0 tank engines of the "Terrier" class. The line is still single track, without any intermediate crossing places, and the method of working is by train staff and ticket. An intermediate signal box, known as Langston Swing Bridge, controls the movements of the bridge at that place.

OIL FUEL ON INDIAN RAILWAYS.



FILLING TANKS WITH OIL FUEL ON THE GREAT INDIAN PENINSULA RAILWAY.

OIL is now being extensively used as locomotive fuel on several of the Indian railways, notably the North Western State and Great Indian Peninsula Railways. On the latter line oil storage tanks have been erected at several places in the vicinity of Bombay, and as far inland as Bhusawal (276 miles), many of the locomotives working in the district being now fired with oil.

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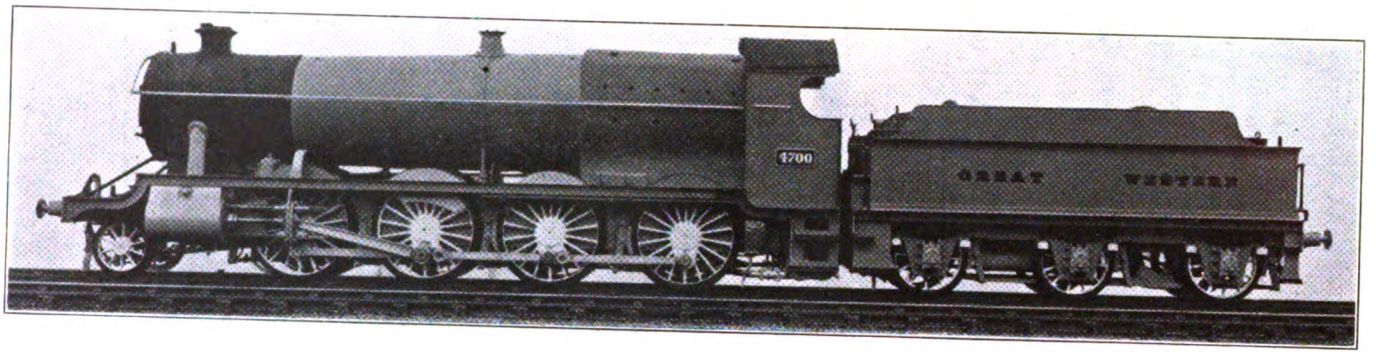
2-8-0 MIXED TRAFFIC LOCOMOTIVE No. 4700, GREAT WESTERN RAILWAY.

Designed by Mr. G. J. Churchward, C.B E., Chief Mechanical Engineer.



IN the June, 1919, RAILWAY MAGAZINE, this engine, the first 2-8-0 mixed-traffic locomotive in British practice, as then placed in service, was illustrated and described. At that time, however, No. 4700 was fitted with the same class of boiler as used for 2-8-0 mineral locomotives, but this has now been replaced by the larger boiler originally intended for it. The new boiler gives the following heating surfaces : superheater tubes, 323·9 sq. ft. ; tubes, 2,062·35 sq. ft. ; firebox, 169·75 sq. ft. ; total, 2,556 sq. ft. Grate area is now 30·28 sq. ft. The barrel of the new boiler is 14 ft. 10 in. long by 5 ft. 6 in. diam. at the front end and 6 ft. at the throat plate. Weight in working order is now 82 tons instead of 77 tons 14 cwt. This engine has been employed on several important passenger trains as well as in goods service, and others of her class are now under construction at Swindon.

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British Locomotive Practice and Performance.

By CECIL J. ALLEN,
A.M.Inst.T., A.I.Loco.E.

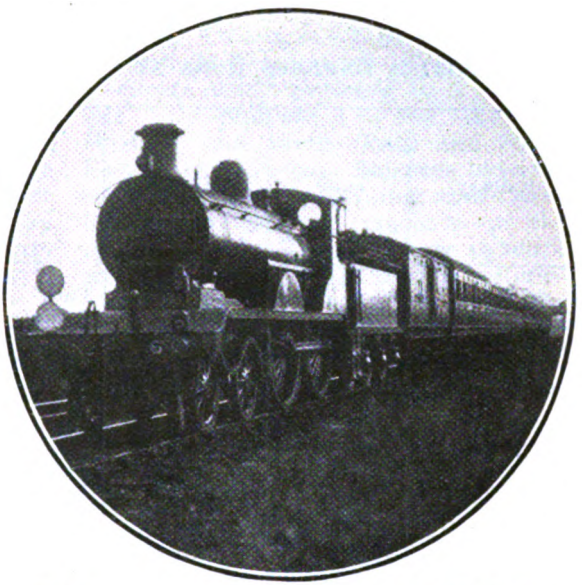

Photo.] [*F. W. Curtis.*
LONDON, BRIGHTON & SOUTH COAST RAILWAY.
Up Portsmouth train. 4-4-0 locomotive, No. 56.

FROM the railway running point of view, the month of October, 1921, has probably proved to recorders of locomotive running one of the most exhilarating in all their experience. Frankly, the accelerations of October came as a surprise to me. In this connection I may, perhaps, quote the letter of a somewhat disgruntled correspondent in the United States, who, after expressing his "distress" at my "apparently inspired remarks" in the September issue as to the improbability of further cuts in main line schedules, continues thus: "As I see it, the railways are now securing 75 per cent. more revenue from each passenger, and as they have had ample time to get the permanent way into good condition, the least the traveller may expect would appear to be pre-war speed, if not frequency of service. We live in an age of speed, and I do not believe that the public will long put up with services inferior to those of, say, fifteen years ago. The American roads here have not much to brag about, but at least they have restored pre-war services."

The *naivété* of this letter is astonishing. Apparently the whole post-war difficulties of British railways to the writer's mind have been concentrated in the task of getting "the permanent way into good condition." Not a word is said as to the arrears of locomotive maintenance to be overtaken, still less as to the general quality of post-war fuel, which makes all the difference in reverting to pre-war speeds. Only the other day I heard of the driver of an up 2-hours' express on the newly-accelerated Birmingham services getting his working pressure down to 90 lb. per sq. in., at a critical stage of the journey, owing to inferior coal, although to his tremendous credit be it said that he managed to maintain his end-to-end times. And then that "75 per cent. more revenue from each passenger"—therefore, "pre-war speed, if not frequency of service"! Has the writer of the letter the remotest conception as to current railway operating conditions in Great Britain? It would do him good to study the trenchant address recently delivered by Sir Henry Thornton to representatives of the Great Eastern Railway staff and of the railway trades unions, when he proved that the cost of operating each 100 passenger train miles had mounted from £17·37 before the war to no less than £55·08 at the present

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BRITISH EXPRESS RUNS AT 55 M.P.H. AND OVER—OCTOBER, 1921.

Railway.	Train.	From.	To.	Miles.	Min.	Av. speed m.p.h.	Best Pre-war-time. Min.	‡ Total No. of runs.
G.W.R. ..	¶11.00 a.m.	Paddington ..	Bath	106.9	105	61.1	108	2+1
L. & N.W.R. ..	2 trains ..	Birmingham..	Coventry ..	18.9	19	59.7	21	2
G.W.R. ..	11.00 a.m.(*a*)	Paddington ..	Bristol ..	118.3	120	59.2	120	1
,, ..	2 trains (*b*)	Bristol ..	Paddington ..	117.6	120	58.8	120	2
,, ..	¶9.41 a.m. ..	Wycombe ..	Banbury ..	41.0	42	58.6	44	0+1
,, ..	¶10.30 a.m.	Paddington ..	Westbury ..	95.6	98	58.5	97	1+1
,, ..	¶5.00 p.m. (*b*)	Bristol ..	Reading ..	81.6	84	58.3	84	0+1
,, ..	3 trains (*c*)	Paddington ..	Exeter ..	173.7	180	57.9	180	3
,, ..	2 trains ..	Banbury ..	Paddington ..	67.5	70	57.9	71	2+1
,, ..	2 trains (*c*)	Wycombe ..	Leamington ..	60.8	63	57.9	63	2
,, ..	4 trains (*c*)	Paddington ..	Leamington ..	87.3	91	57.6	91	4+2
,, ..	¶10.30 a.m.	Paddington ..	Taunton	142.9	149	57.6	150	1+1
G.C.R. ..	1.07 p.m. ..	Risborough ..	Brackley ..	27.8	29	57.5	29	1
,, ..	5.20 p.m. ..	Risborough ..	Finmere ..	23.0	24	57.5	*	1
L. & N.W.R. ..	3.45 p.m. ..	Coventry ..	Watford ..	76.5	80	57.4	*	1
Caledonian R.	4.35 p.m. ..	Forfar ..	Perth	32.5	34	57.4	34	1
L. & N.W.R. ..	3 trains (*c*)	Euston ..	Coventry ..	94.0	99	57.0	103	4
G.C.R... ..	2 trains ..	Rugby ..	Leicester ..	19.9	21	56.9	20	2
G.W.R. ..	12.25 p.m.	Newton Abbot	Paddington ..	193.9	205	56.8	*	1
G.C.R. ..	3.20 p.m. (*d*)	Marylebone ..	Leicester ..	103.1	109	56.8	109	2
,, ..	6.20 p.m.(*e*)	Marylebone ..	Leicester ..	107.6	114	56.6	114	1
L. & N.W.R. ..	9.27 a.m. ..	Willesden ..	Blisworth ..	57.5	61	56.6	62	1
,, ..	§9 trains (*c*)	Euston ..	Birmingham..	113.0	120	56.6	120	§9
G.C.R... ..	7.22 p.m. ..	Woodford ..	Aylesbury ..	31.1	33	56.5	33	1
G.W.R. ..	4.15 p.m. ..	Paddington ..	Chippenham..	94.0	100	56.4	97	1
G.C.R... ..	4.38 a.m. ..	Leicester ..	Arkwright St.	22.5	24	56.3	22	1
G.W.R. ..	¶4.00 p.m. ..	Paddington ..	Bicester ..	53.4	57	56.2	60	0+1
G.C.R... ..	2 trains ..	Leicester ..	Nottingham ..	23.4	25	56.2	24	2
Midland R. ..	5.49 p.m. ..	Kettering ..	St. Pancras ..	72.0	77	56.1	76	1
,, ..	12.31 p.m...	Appleby ..	Carlisle ..	30.8	33	56.0	32	1
G.W.R. ..	2.49 p.m. ..	Reading ..	Taunton ..	106.9	115	55.8	117	1
,, ..	1.30 p.m. ..	Paddington ..	Worcester ..	120.5	130	55.6	129	1
Midland R. ..	6 trains ..	St. Pancras ..	Leicester ..	99.1	107	55.6	106	7
,, ..	5.40 a.m. ..	Trent.. ..	St. Pancras ..	119.8	130	55.3	130	1
G.W.R. ..	†2 trains ..	Paddington ..	Birmingham..	110.6	120	55.3	120	†2
Midland R. ..	9.07 a.m. ..	Manton ..	St. Pancras ..	90.1	98	55.2	*	1
G.W.R. ..	¶1.30 p.m. ..	Paddington ..	Kingham ..	84.7	92	55.2	94	0+1
G.C.R... ..	3.45 a.m. ..	Brackley ..	Rugby ..	23.9	26	55.2	24	1
S.E. & C.R. ..	6.00 p.m. ..	Tonbridge ..	Folkestone ..	40.5	44	55.2	*	1
L. & N.W.R. ..	9.30 a.m. ..	Rugby ..	Euston ..	82.6	90	55.1	90	1
N.E.R. ..	9.25 p.m. ..	York	Darlington ..	44.1	48	55.1	43	1
L. & S.W.R. ..	5.25 p.m. ..	Basingstoke ..	Surbiton ..	35.8	39	55.1	40	1
Midland R. ..	3 trains ..	St. Pancras ..	Nottingham ..	123.5	135	55.0	135	3
G.C.R... ..	9.30 a.m. ..	Finmere ..	Aylesbury ..	16.5	18	55.0	*	1

‡ Figures in this column indicate total number of runs performed at 55 m.p.h. or over, *plus* runs by slip coaches. ¶ By slip carriage. * No corresponding pre-war run. (*a*) *Via* Bath. (*b*) *Via* Badminton. (*c*) In both directions. (*d*) *Via* Aylesbury. (*e*) *Via* Wycombe. † Also 5 trains making intermediate stops. § Also 2 trains making intermediate stops.

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time. This enhanced percentage of 217 has to be set against the comparatively modest jump of 91 per cent. in receipts, and obviously any increase in the speed and frequency of long-distance trains spells a still further enhancement of operating costs. It is on this account a surprisingly courageous move on the part of several of the leading British railway companies to revert to main line train service conditions almost identical with those of pre-war days.

It is futile to adduce as a comparison what the American railroads have already done in this direction. To begin with, facilities fully equal to pre-war; and to the Great Central and London and North Western Railways, both of whom now accelerate many expresses to a pre-war rate of progression. The London, Brighton and South Coast and South Eastern and Chatham Railways have for some time had in operation time-tables fully up to pre-war standards—in the latter case even better. I have so much ground to cover in the realm of performance this month that it would be idle for me to attempt to deal in detail with the accelerated train services; furthermore, "Voyageur" contributes elsewhere in the

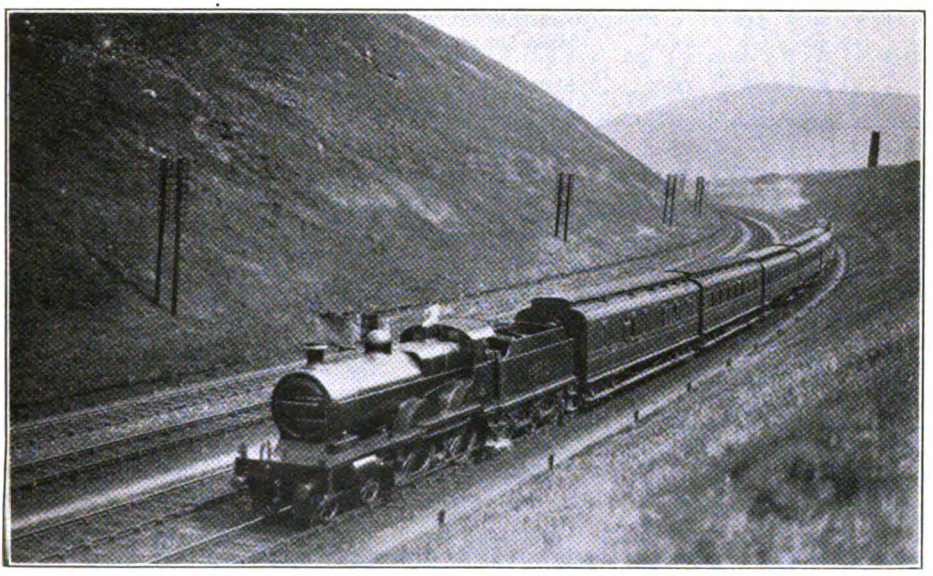

Photo.] MIDLAND RAILWAY. [*W. H. Whitworth.*

Down Manchester express near Bugsworth. Compound 4-4-0 locomotive, No. 1012.

average American speeds were before the war a long way from even approaching to British standards of speed. To add to that, the war vicissitudes through which American railroads passed were, both in duration and intensity, but a fraction of those suffered by British lines. Nothing but praise, therefore, is due in particular to the Great Western Railway, which restores both pre-war speed in its entirety, and practically pre-war frequency of service; also to the Midland Railway, whose October time-table, if falling the merest shade short of the pre-war speed level, in its systematic distribution of a lavish service of trains offers average

present issue an analysis of the winter train services, on the lines of his usual summer train service article, to which little need be added. I have, however, gone to the trouble of preparing the annexed table of runs now made daily in this country at speeds of 55 m.p.h. and over, so that the finest feats of speed may come under review.

In this table the Great Western Railway easily carries off the honours with a total of 24 runs, *plus* 10 runs made by slip coaches, which I do not include in the totals, seeing that they are in all cases coaches detached from the 24 trains just referred to. The Exeter slip of the down

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G.W.R. "CORNISH RIVIERA LIMITED" EXPRESS.

DOWN—4-cyl. 4-6-0 No. 4003, *Lode Star*. Driver Springthorpe. Load to Westbury: 406 E., 425 F. Taunton: 341 E., 355 F. Exeter: 282 E., 295 F. Plymouth: 249 E., 260 F.

UP—4-cyl. 4-6-0 No. 4024, *King James*. Driver Rowe. Load, Plymouth-Exeter: 249 E., 265 F. Exeter-Paddington: 312 E., 330 F.

Schedule.	Actual.	† Speeds.	Distance.	Stations.	Distance.	Schedule.	Actual.	† Speeds.
Min.	M. S.	M.p.h.	Miles.	Down. Up.	Miles.	Min.	M. S.	M.p.h.
0	0 00	—	0.0	dep. Paddington .. .. arr.	173.7	180	179 40	—
							sigs. 1¼′	*5
—	3 15	—	1.3	pass Westbourne Park .. ,,	172.4	—	176 10	—
—	9 40	—	5.7	,, Ealing .. .. .. ,,	168.0	—	171 40	62½
11	13 20	55½	9.1	,, Southall .. .. ,,	164.6	169	168 20	—
—	17 40	—	13.2	,, West Drayton .. ,,	160.5	—	163 50	—
							sigs. 1¾′	*50
20	22 35	65	18.5	,, Slough .. .. .. ,,	155.2	160	158 40	64½
—	*p.w.r.* 3′	*25	—	,, Burnham Beeches .. ,,	—	—	*sigs.* ¼′	*60
—	27 25	—	22.5	,, Taplow .. .. ,,	151.2	—	155 05	72½
25½	29 50	—	24.2	,, Maidenhead .. .. ,,	149.5	154½	153 35	72½
31½	37 10	62½	31.0	,, Twyford .. .. ,,	142.7	148	147 45	67
37	42 15	*45	36.0	,, Reading .. .. ,,	137.7	143	142 30	*40
	p.w.r. 1½′							
—	44 50	*20	37.8	,, Southcote Junc. .. ,,	135.9	—	140 00	*48
—	49 40	—	41.2	,, Theale .. .. .. ,,	132.5	—	136 50	70½
—	55 35	55	46.7	,, Midgham .. .. ,,	127.0	—	132 15	72½
56	62 30	57½	53.1	,, Newbury .. .. ,,	120.6	125	126 50	67
—	68 15	59	58.5	,, Kintbury .. .. ,,	115.2	—	122 10	71½
—	71 25	55½	61.5	,, Hungerford .. .. ,,	112.2	—	119 30	66
—	76 30	57½	66.4	,, Bedwyn .. .. ,,	107.3	—	115 10	68
73½	80 40	46½	70.1	,, Savernake .. .. ,,	103.6	109	111 35	56½
—	85 50	72½	75.3	,, Pewsey .. .. ,,	98.4	—	106 10	61
—	91 15	—	81.1	,, Patney .. .. ,,	92.6	—	98 55	—
	p.w.r. 2½′	*25					*p.w.r.* 2½′	*20
—	98 25	75	86.9	,, Lavington .. .. ,,	86.8	—	92 20	67
—	102 05	—	91.4	,, Edington .. .. ,,	82.3	—	88 05	59
	p.w.r. 1½′	*25						
97½	107 50	*30	95.6	slip Westbury .. .. ,,	78.1	84	83 05	*35
—	115 10	*35	101.3	pass Frome .. .. .. ,,	72.4	—	75 55	*30
—	121 55	53	106.6	,, Witham .. .. ,,	67.1	—	70 50	72½
—	124 10	49	108.5	,, Mile-post 122¾ .. ,,	65.2	—	68 30	34½
—	127 10	82	111.9	,, Bruton .. .. ,,	61.8	—	64 05	51
120	130 00	*69	115.3	,, Castle Cary .. .. ,,	58.4	62	60 35	—
—	131 50	75	117.4	,, Alford .. .. .. ,,	56.3	—	58 40	71½
—	136 00	70½	122.4	,, Charlton Mackrell .. ,,	51.3	—	54 15	—
—	138 45	77½	125.7	,, Somerton .. .. ,,	48.0	—	51 10	56½
—	142 55	79	131.0	,, Curry Rivell Junc. .. ,,	42.7	—	46 05	69
144	148 30	72½	137.9	,, Cogload Junc. .. ,,	35.8	38	39 35	*60
149	152 45	69	142.9	slip Taunton .. .. ,,	30.8	33	35 10	70½
—	154 30	70½	144.9	pass Norton Fitzwarren .. ,,	28.8	—	33 25	—
—	159 15	60	150.0	,, Wellington .. .. ,,	23.7	—	29 30	75
—	164 00	39½	153.8	,, Whiteball Box .. ,,	19.9	—	25 35	42
—	168 35	79	158.8	,, Tiverton Junc. .. ,,	14.9	—	19 40	58½
—	173 45	75	165.3	,, Hele .. .. .. ,,	8.4	—	12 40	52
—	177 30	80½	170.2	,, Stoke Canon .. .. pass	3.5	—	7 00	49
							sigs. 1′	*5
180	180 55	*30	173.7	slip Exeter .. .. } dep.	0.0	0	0 00	—
				} arr.	52.0	68	67 10	—
—	186 15	70½	178.4	pass Exminster .. .. ,,	47.3	—	61 30	62½
—	189 40	*60	182.2	,, Starcross .. .. ,,	43.5	—	57 45	60
—	196 20	*45	188.7	,, Teignmouth .. .. ,,	37.0	—	50 20	*53

† Maximum and minimum speeds, by chronograph. * Speed reduced by brakes to these figures.
E—Tons empty. F—Tons full.

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G.W.R. "CORNISH RIVIERA LIMITED" EXPRESS—*Continued.*

Schedule.	Actual.	† Speeds.	Distance.	Stations.			Distance.	Schedule.	Actual.	† Speeds.
Min.	M. S.	M.p.h.	Miles.	Down.		Up.	Miles.	Min.	M. S.	M.p.h.
203	202 20	*35	193.9	pass	Newton Abbot ..	arr.	31.8	45	43 40	*30
209½	208 20	30½	197.7	,,	Dainton Box	,,	28.0	40	37 55	19½
215½	213 40	*60	202.5	,,	Totnes..	,,	23.2	33	31 30	*60
—	217 25	32½	205.3	,,	Tigley Box	,,	20.4	—	28 30	*53
223	220 25	37	207.1	,,	Rattery Box	,,	18.6	27	26 35	*50
225	223 30	60	209.4	,,	Brent	,,	16.3	24	24 00	*60
—	226 00	52½	211.6	,,	Wrangaton	,,	14.1	—	21 40	50½
—	229 20	*52	214.9	,,	Ivybridge	,,	10.8	—	17 40	48
237	233 30	64½	219.0	,,	Hemerdon Box ..	,,	6.7	12	12 10	49½
—	236 00	*70½	221.7	,,	Plympton	,,	4.0	—	6 25	58½
	sigs. ¾′									
245	239 25	*20	224.2	,,	Lipson Junc.	pass	1.5	3	3 50	—
	sigs. 3½′	*5								
247	244 50	—	225.7	arr.	Plymouth (N. Rd.) ..	dep.	0.0	0	0 00	—

† Maximum and minimum speeds, by chronograph. * Speed reduced by brakes to these figures.

"Riviera" I have treated as a train, because the full run to Plymouth falls short of the 55 m.p.h. average. Then follow the London and North Western Railway with 18 runs, the Midland with 14, the Great Central with 13, and the Caledonian, South Eastern and Chatham, North Eastern and London and South Western with one each. The total is therefore no less than 73, of which the Great Western monopolises almost exactly one-third, in addition to taking all the first dozen places in the table, save one only—a notable record. The accelerated Birmingham services by the two rival routes claim 28, or 38 per cent., of the total 73 runs, and one-half the slip coach runs; all the London and North Western 55 m.p.h. journeys are made on these trains. It is worthy of note that the averages of the present and the pre-war times for the same stretches of line are practically identical, as showing that the restoration of speed is a very complete one. One fact which can hardly escape comment in connection with this table

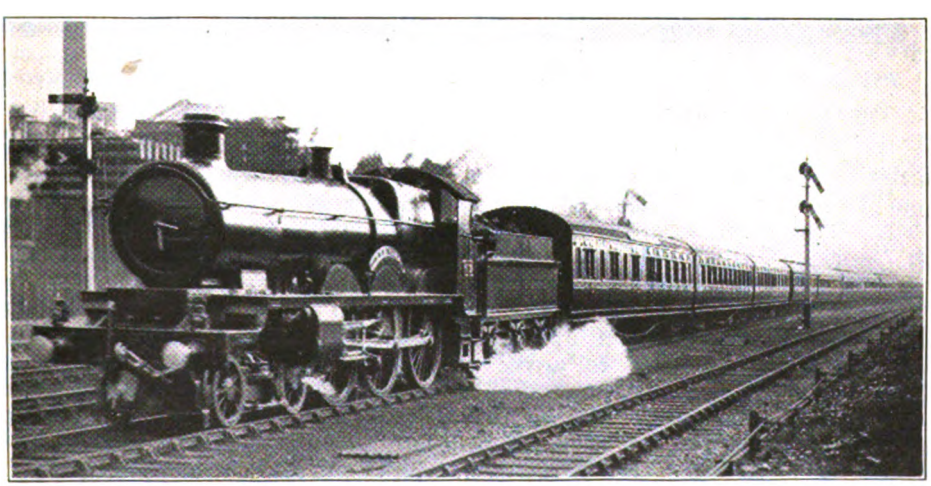

Photo.] GREAT WESTERN RAILWAY. [*F. E. Mackay.*

Down "Cornish Riviera" express. 4-6-0 four-cylinder locomotive, No. 4006, "Red Star."

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is that the Great Northern Railway—in the past one of the most famous lines for speed in the country—does not so much as appear in it. And even the North Eastern Railway, which at one time so proudly headed the annual return of "fastest runs" with its 43-min. "snippet" from Darlington to York, is content with one representative only, and that in a modest position but four places above the foot of the table. How are the mighty fallen!

One of the most remarkable features of the winter services is that the Midland Railway, for the first time in all history, by 5 minutes. The latter company has not the reputation of taking such challenges "lying down," and I believe that a reply suitable to the occasion is in course of formulation. Certainly some remarkable "flying" trials have been made on the Great Northern Railway during recent months with the new quintuplé Gresley dining car set. One was from King's Cross to Huntingdon and back, in which the start-to-stop 59-mile journey was accomplished with ease in the schedule of one hour, both ways, and, I believe, with something to spare. No. 1460 has also worked this 118-ton train from

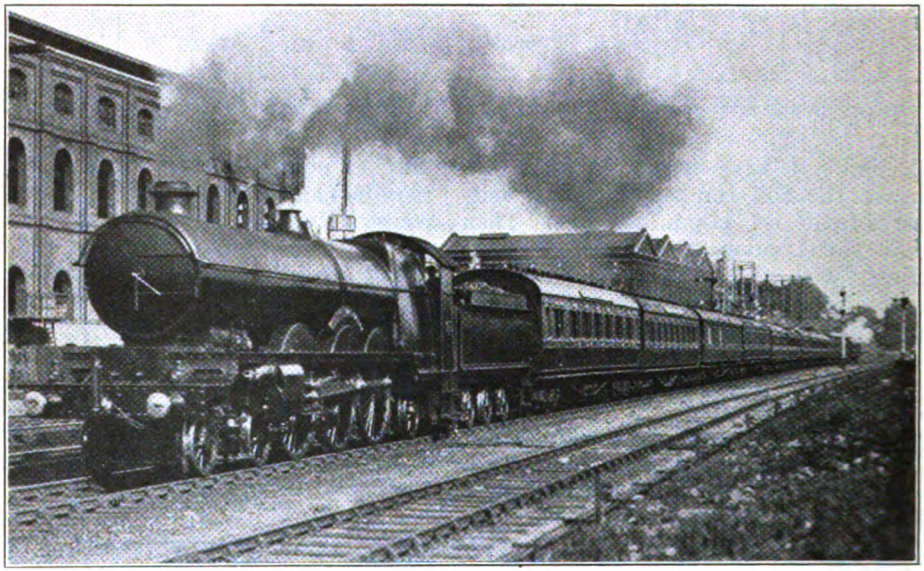

Photo.] GREAT WESTERN RAILWAY. [*F. E. Mackay.*

Down Cheltenham Tea car express. Four-cylinder 4-6-2 locomotive, No. 111, "The Great Bear."

carries off the palm in the matter of time from London to both Manchester and Leeds. True, the times in the former case are "working" times only, the 2.25 p.m. from St. Pancras being due at Manchester at 6.21 p.m., advertised as 6.25 p.m., and the 9.47 a.m. up (advertised 9.45) being booked to arrive in London at 1.43 p.m., instead of the 1.45 of the public sheets, but the fact is significant. In the case of Leeds the superiority is absolute, the 12.15 p.m. down "Scotsman" being publicly advertised to arrive there at 4.10 p.m., and thus beating the Great Northern "best" Grantham to King's Cross in 104½ min., and could have completed the trip in 101 min., but for a very cautious time of 16½ min. over the concluding 12¾ miles in from Potter's Bar.

Again, a Nottingham race special was publicly booked up from the racecourse station to King's Cross recently in 140 min. for 127 miles, with main line passing times well in advance of anything done on the Great Northern Railway for years past. As for the unimpaired capacity of the Great Northern for speed, even with heavy trains, a correspondent of unimpeachable accuracy has just sent me

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details of a run behind "Atlantic" No. 1442, with a 51-axle train weighing 344 tons empty and 360 tons full, in which the 29·1 miles from Grantham to Peterborough were completed in 32 min. 20 sec., despite a slack over Werrington troughs; Stoke was passed in 10 min. 48 sec., after which the 15 miles 19 chains from Corby to Helpston were reeled off in 11 min. 27 sec., average almost exactly 80 m.p.h., and inclusive of a maximum of 86·5 for a complete half-mile! So it is quite evident that momentous developments may be looked for ere long on the Great Northern Railway—perhaps even by the time these lines are in print.

I am indebted to Mr. Felix J. C. Pole, General Manager of the Great Western Railway, for facilities afforded me to make a journey through to Penzance and back on the "Cornish Riviera Limited" express, which was destined to prove an unforgettable trip. Let it be said at once that no special arrangements were made for unusually fast running; in fact, I felt at first rather unfortunate in my choice of a day for the down journey, seeing that fog prevailed at the London end, and occasioned a late start of 3 minutes, while no less than four bad permanent way cautions were operative between Paddington and Westbury. But

Photo.] GREAT WESTERN RAILWAY. [*Rex Murphy.*

Bristol–Paddington express near Bathampton. 4-4-0 engine, No. 3825, "County of Denbigh."

Now for performance, and truly the description of my experiences during the month of October is the most joyous of tasks. It was a custom in January issues of pre-war years to devote the "Performance" space to details of my best runs during the year just expired; no such course will be necessary in the next issue, seeing that the Great Western Railway runs to be described in this number and that for February next, not only carry off—with perfect ease—all my 1921 records, but nearly all of them in some particular beat my finest pre-war experiences as well. First and foremost I was, on the other hand, supremely fortunate in finding at the regulator of 4-cylinder 4-6-0 No. 4003, *Lode Star*, that prince of drivers, J. Springthorpe, of Old Oak. So it was that the late start and the delays to Westbury furnished just the incentive he needed for the astounding performance that followed, which was, in brief, a gain of no less than *sixteen minutes* clear between Westbury and Lipson Junction at Plymouth!

Nothing short of tabulation in the detailed manner annexed would do justice to this extraordinary effort. It will be seen that I show throughout, in parallel

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columns, the distances, schedule times, actual times, and maximum and minimum *en route* speeds. The load of the train, which reached the substantial total of 406 tons tare, and 425 tons in all, consisted of two vehicles for Weymouth, slipped at Westbury; one for Minehead and one for Ilfracombe, slipped at Taunton; one for Torquay, slipped at Exeter; one detached at North Road for Plymouth; one detached at Truro for Falmouth; one detached at St. Erth for St. Ives; and four, including dining car, for Penzance—a train of eight portions, exclusively 70 ft. stock, except the Ilfracombe coach. As I have previously mentioned, the start such as to command admiration. There is a vertical rise of some 350 ft. between these points, and 7 miles of the ascent are at from 1 in 200 to 1 in 125 in steepness, yet our average speed up the 28·9 miles concerned was all but 56 m.p.h., with 425 tons.

After Westbury, however, we suffered no further delays. Slacking there as enjoined, we recovered rapidly up the 1 in 226–151 to Frome, and again reduced speed carefully, round the curve at that station. From Frome we accelerated up rising grades to 53 m.p.h., and topped "122¾" summit (the final 1¾ miles of which ascent includes a mile at 1 in 112–107) at

Photo.] GREAT WESTERN RAILWAY. [*H. T. Worlock.*

Birmingham–Paddington express near Northolt. 2-cyl. 4-6-0 locomotive, No. 2919, "St. Cuthbert."

was 2 min. late, owing to fog, and the four bad permanent way checks—at Burnham Beeches, Southcote Junction, Patney and Edington occasioned, as nearly as I can estimate, a loss of 8½ min. The remaining 1 min. 50 sec. of the 13 min. 20 sec. arrears at Westbury had been dropped by the engine, the going from Paddington to Reading appearing, according to Great Western standards, a little on the leisurely side. But for this the mist, which we left behind after Reading, was partially responsible. To Westbury, therefore, there was not much of note to record, save the work over the rising grades from Theale to Savernake, which is invariably 49—another sterling achievement. And now the pace became simply electrifying. Just look at the *average* speeds—68·9 m.p.h. for the 65·2 miles from "122¾" to Exeter; 71 for the 41·5 miles from "122¾" to Wellington; 73·1 m.p.h. for the 26 miles from Bruton to Cogload, by no means exclusively on falling grades! Furthermore, the "122¾"—Exeter stretch includes the formidable ascent to Whiteball, the work up which, with a train of all but 300 tons, was simply amazing. Two miles at 1 in 255 are included in the rising grades from Cogload to Taunton, but only sufficed to reduce the speed from 72½ to 69 m.p.h.; Norton Fitzwarren to

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Wellington is an ascent incorporating 2 miles at 1 in 214 and 2 at 1 in 165, yet even at Wellington we had not gone below 60; and then the 2¼ miles at 1 in 81–90 to the tunnel, and the half-mile at 1 in 126 through it, brought us down finally to the merest shade under 40 m.p.h.! There were slight reductions of speed over curves between Whiteball and Exeter, but we got up to 80·3 m.p.h. at Stoke Canon, in addition to the 81·8 already recorded at Bruton.

And then the running between Exeter and Plymouth was a "classic" in itself. Truly the sting of this journey is "in the tail," banks at 1 in 36 to 50 having to be faced after the engine has been hard at work for well over three hours, when the fire is not at its cleanest. Fortunately, however, the load had by now dwindled, through the three successive slips, to some 260 tons, in place of the 425 tons with which we had started out of London. Accelerating with tremendous rapidity out of Exeter, we were doing 70½ m.p.h. at Starcross troughs, but Springthorpe ran very carefully round the curves between there and Newton Abbot; in fact, the scrupulous observance of service slacks and the moderation of speed round sharply curved portions of line were throughout notable features of the run. After slowing for Newton Abbot, we reached 49 m.p.h. at Aller Box before tackling the 2½ miles of Dainton Bank, averaging in inclination 1 in 57, but steepening for one short pitch near the summit to the truly fearsome figure of 1 in 36. Yet our lowest speed on the bank was over 30 m.p.h.!

The same applies to Rattery—much longer, with its 4⅜ miles of ascent, averaging 1 in 66, although its worst "pitch" is less steep, averaging as it does round about 1 in 50; here again we were running at 32½ m.p.h. at Tigley box, having commenced the ascent at precisely 60. Again, after Rattery, it was on substantially rising grades that we accelerated to 60 m.p.h. at Brent, and the subsequent length up at 1 in 254–132 to Wrangaton did not bring us below 52½ m.p.h. Thus it was, despite the most cautious running down Dainton and Hemerdon inclines (the "70" on the latter was merely momentary) that we should have completed the 31·8 miles from Newton to the stop at Plymouth in the record time of 38 min., or a shade over, had we not been delayed from Lipson Junction onwards by that obstructive London and South Western "slow" which is not due at North Road until 2 minutes before the "Limited" is booked to run in over the same line. This unfortunate arrangement effectually disposes of any chance the famous "flier" might have of arriving in the least degree before time.

My allowances in respect of delays have all been made with great care, on the basis of the running up to the point at which each delay occurred, and I think they will be found to err on the side of moderation rather than the reverse. I estimate that approximately 1 min. 50 sec. must go against the engine between Paddington and Westbury, as previously mentioned, whereas the running from Westbury to Plymouth showed a clear gain of 12½, and a net gain of 16¾ min. on schedule time. Ultimately, therefore, the gain to engine works out at precisely 15 minutes, leaving a net time of 232 minutes for the 225·7 miles from Paddington to Plymouth. For this wonderful achievement Driver Springthorpe and his fireman, Belcher, deserve the greatest credit. It is difficult to know what particular part of the journey to single out for the greatest praise, as the whole of it beyond Westbury was of such outstanding merit. For myself, I little expect, for years to come, to repeat the average speed of over sixty miles an hour that we maintained on this occasion over 113 miles of the "mountains of the west"—from milepost 122¾ to Plympton, 113·2 miles in 111 min. 50 sec. I could not fail to be struck on this trip with the keen interest of all the crew of the train in its welfare; even in the restaurant car the names and merits of all the different drivers were well known, so that to the excellence of the *menus* and the courtesy of the service were added an enthusiasm on the part of the staff that helped to make the trip to myself one peculiarly memorable.

By comparison the up journey is bound to pale a little, although Driver Rowe's work with 4-cylinder 4–6–0 No. 4024, *King James*, was undoubtedly very fine. But delays were few, and the incentive was therefore less. As always, the work west of Exeter was of great interest; the 2 miles of Hemerdon bank, averaging 1

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Photo.] GREAT CENTRAL RAILWAY. [*H. T. Worlock.*

3.15 p.m. Marylebone–Sheffield express near Neasden, hauled by two 4-4-0 locomotives.

in 42, were commenced at 58·4 and finished at 19½ m.p.h.; Dainton, commenced at 50½, was topped at precisely the same speed as Hemerdon. This west side of Dainton is, of course, appreciably harder than the east side, even if shorter, the last ¾-mile being wholly inclined at 1 in 43 to 1 in 37, with an average of 1 in 39; while the preceding mile is mostly at 1 in 55–76. It should also be borne in mind that the line from Hemerdon to Wrangaton is all against the engine, and includes considerable lengths of adverse gradient between 1 in 100 and 210. We had gained 2 min. to Dainton box, both the worst climbs having been negotiated in less than schedule time, but very restrained running from Dainton to Exeter whittled the gain down to 50 sec. on arrival at the latter place.

On re-starting from Exeter, our load had been made up to nine 70-ft. cars, and therefore reached the substantial total of 330 tons. We were evidently doomed to suffer delay from London and South Western trains, as this time the 1.42 p.m. "slow" to Ilfracombe left just in front of us, so that we were all but stopped twice in the yard, waiting for the South Western train to clear Cowley Bridge Junction. Here again the time-table arrangement seems capable of improvement, in that an unimportant train like the 1.42 should be allowed away just 3 minutes in advance of the London express, using the same metals for 1¼ miles. In this way we lost at least a minute, and probably more. The ascent to Whiteball was good, without being notable, and we reached no exceptional speed on the subsequent descent of Wellington bank; consequently we were over "two down" at Taunton. Once again, however, I was destined to record unusually fine work over the Cogload-Castle Cary "cut-off"; to the 5½ min. gained over it on the previous day we added now another 3 min., the merit of the two achievements being about equal, seeing that the tendency of the road is distinctly against the up trains. Indeed, the 8·4 miles from Curry Rivell to Charlton Mackrell are almost entirely up at 1 in 264–330, yet they did not bring us below 56½ m.p.h. The minimum of 34½ m.p.h. up the 4 miles, mostly at 1 in 98–81, to mile-post "122¾," was also good.

After the slacks at Frome and Westbury have been negotiated, the engine is faced with the practically impossible task of climbing the 25·5 miles to Savernake in 25 min.; in our case the task was rendered yet more impossible by the bad slack at Patney. Prior to that, however,

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we had accelerated to 67 m.p.h. on the faintly rising grades past Edington, and mounted 6 miles at 1 in 222 at a sustained minimum of 55·6 m.p.h.—a very fine feat. Again, after the Patney check, we did well to reach 61 m.p.h. on the 1½ miles of slight fall beyond Woodborough, and to maintain 56½ m.p.h. up the 6 miles' climb thence to Savernake, concluding as it does at 1 in 151. Even so, had there been no slack at Patney, we should still have lost a minute on schedule from Westbury to Savernake. But on the ample timing from Savernake to Reading, with the most moderate of downhill speeds, it was an easy matter to regain 3 min., so that we were once again ahead of time. A fine effort was put forward after Reading, the regaining of speed being particularly smart, as witness the time of 5¼ min. from Reading to Twyford. The maximum of 72½ m.p.h. on a level track was cut short, however, by the string of signal checks from Burnham onwards, which I have allowed for to the best of my ability. Nevertheless, we stopped at Paddington just inside schedule time, although without the signal checks we ought to have arrived about 3½ min. early. For the whole journey of 173·7 miles from Exeter I make the net time 173 min., and this gain of 7 min., added to the minute between Plymouth and Exeter, makes up a total of 8 min. to engine, under the capable handling of Rowe—another first-class piece of work, even if not quite as spectacular as that of the down journey.

On the running in Cornwall I will not dwell at length; suffice it to say that No. 4025, *King Charles*, 4-cylinder 4-6-0, on the down journey gained 6 min. net between Plymouth and Penzance, observing almost exactly the booked arrival and departure times at Truro, Gwinear Road and St. Erth, despite exceedingly bad p.w.r. slacks over Saltash bridge and through the tunnel between Lostwithiel and Par. Downhill speeds throughout were most restrained, over the tortuous curves which characterize this route; in fact, we never so much as touched 60 m.p.h.; uphill work was excellent, as the gradients at all points are very severe, including as they do many miles at between 1 in 60 and 80 in steepness. The best feature of the Plymouth-Truro length, with 220 tons, was the 25 min. 25 sec. for the 19 miles from Par to Truro (allowed 29 min.). From Truro onwards the load was 185 tons, and from St. Erth to Penzance 150 tons. In the reverse direction, with precisely the same loads, 2-6-0

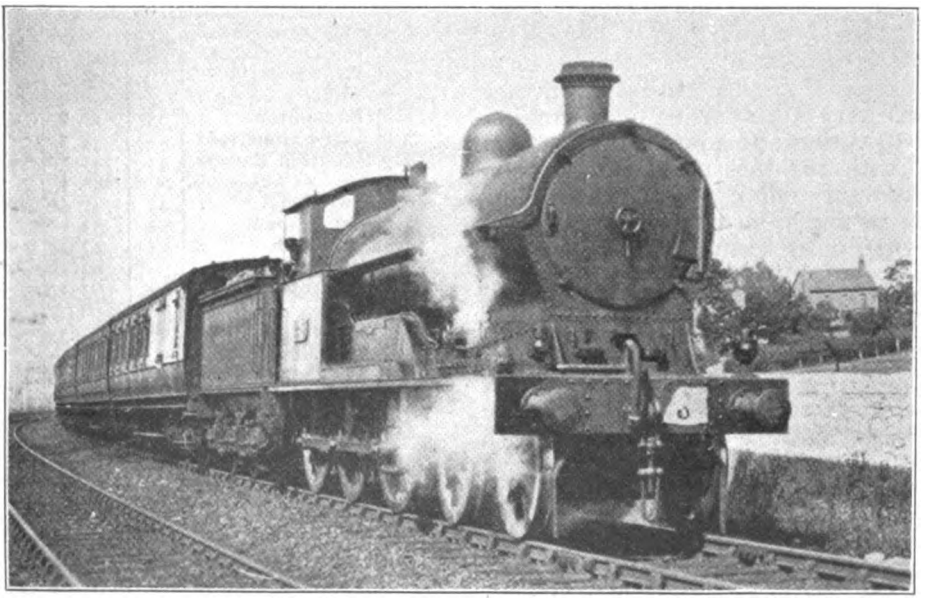

Photo.] LONDON & NORTH WESTERN RAILWAY. [*W. H. C. Kelland.*

Llandudno–Birmingham train leaving Llandudno Junction. 4-6-0 locomotive, No. 2205, "Anglia."

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G.W.R. 11 A.M. PADDINGTON–BRISTOL.

Distance.	Engine : 4-cyl. 4–6–0 No. : Load (tons tare) : Load (tons full) :		†4012 303 §320	‡4007 332 350
Miles.		Schd min.	m. s.	m. s.
0.0	Paddington ..	0	0 00	0 00
1.3	Westbourne Park	—	3 05	—
5.7	Ealing	—	8 50	—
9.1	Southall	11	12 25	12 19
18.5	Slough	20	20 50	20 45
24.2	Maidenhead ..	25½	25 55	25 41
31.0	Twyford	31½	32 00	—
36.0	Reading	37	36 30	35 58
41.5	Pangbourne ..	—	41 25	—
48.5	Cholsey	—	47 35 sigs. 5′	—
53.1	Didcot	53½	53 20	51 38
60.4	Wantage Road ..	—	63 25	59 00
66.5	Uffington ..	—	69 30	—
71.6	Shrivenham ..	—	73 55	—
77.3	Swindon	77	79 35	77 59
82.9	Wootton Bassett	—	84 30	83 57
87.7	Dauntsey ..	—	88 20	—
94.0	Chippenham ..	93	93 05	93 26
98.3	Corsham	—	96 55	—
104.6	Bathampton ..	—	102 05	102 59
106.9	Bath (slip) ..	105	104 25	‖105 22
113.1	Saltford	—	109 05	
116.7	St. Anne's Park	—	114 05	
118.3	Bristol	120	117 00	

† *Knight of the Thistle.* ‡ *Rising Star.*
§ 250 tons from Bath. ‖ Arrival of slip portion.

No. 5383 did well from Penzance to Truro; time was kept to St. Erth, then the five very steeply rising miles from St. Erth to Gwinear Road were run start-to-stop, with 185 tons, in 9 min. 55 sec. (allowed 11 min.), speed not falling below 30 m.p.h. on the 1 in 59; lastly, the 15·1 miles from Gwinear Road to Truro were run in 26¼ min. (allowed 26 min.), despite the usual severe tablet-changing slacks at Drump Lane and Scorrier, and a dead stand for signals at Chacewater—net time 24 min. From Truro to Plymouth No. 2937, *Clevedon Court*, 2-cylinder 4–6–0, kept time with the same two bad checks as on the down journey, and had 40 sec. in hand on arrival—net time about 77 min. The best feature of 2937's work was the ascent of 5·9 miles from Bodmin Road to Doublebois in 10½ min. exactly, with 225 tons, speed being maintained at 27 m.p.h. on 1 in 59, and increasing to 31 on 1 in 90, of which two grades the bank is largely composed. On the complete round from Paddington to Penzance and back, therefore, the engines were responsible for gaining no less than 33 minutes between them, on these crack schedules, in the regaining of *en route* delays!

Now let us repair to the London-Bristol route, where my first trial of the restored 2-hour timings furnished me with another exceptional trip. This was a unique return journey, seeing that, in both directions, I was not the only "recorder" on the train; unknown to each other, that well-known expert on Great Western matters—Mr. W. J. Scott—was my companion on the down journey, and another Great Western enthusiast subsequently sent me a careful record of the running of the 5 p.m. up, on which I travelled! The day's round was *not* unique, however, in that in both directions we suffered the cruellest of checks

G.W.R. BRISTOL–PADDINGTON.

Distance.	Engine : 2-cyl. 4–6–0 No. : Load (tons tare) : Load (tons full) :		†2938 210 §225	‡2906 242 255
Miles.		Schd min.	m. s.	m. s.
0.0	Bristol	0	0 00	0 00
1.6	Stapleton Road ..	—	4 00	—
4.8	Filton Junc. ..	9½	10 05	10 25
7.7	Winterbourne ..	—	14 20	14 30
13.0	Sodbury	—	20 40	20 56
17.6	Badminton ..	25	26 00	26 12
27.9	Little Somerford	—	34 50	—
34.7	Wootton Bassett	41	41 10 sigs. ½′	42 00
40.3	Swindon	47	47 30	48 01
46.0	Shrivenham ..	—	53 00	—
51.1	Uffington ..	—	57 15	—
57.2	Wantage Road ..	—	62 10	63 04
61.1	Steventon ..	—	65 15 sigs. 1½′	—
64.5	Didcot	68	69 35 sigs. 7′	69 12
76.1	Pangbourne ..	—	86 15	—
81.6	Reading	84	91 50	84 10
86.6	Twyford	—	98 20 sigs. 3½	—
93.4	Maidenhead ..	94½	105 35	94 06
99.1	Slough	100	112 30	98 59 sigs. ¾′
108.5	Southall	109	121 20 sigs. 1¾′	108 45
117.6	Paddington ..	120	132 50	119 20
117.6	Next time (min.)	120	118½	118½

† *Corsham Court.* ‡ *Lady of Lynn.*
‖ 195 tons from Reading.

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at Didcot. I could not ascertain the cause of the trouble in the down direction, but on the up run the 3.55 p.m. semi-fast from Birmingham, running 8 min. late, was allowed at Didcot to take the main line immediately in front of us, with the result that ultimately we suffered some 13 min. delay. This seemed the more inexcusable, as the up relief line was sufficiently clear for an *empty stock* train, running at a good speed, to overhaul a two-hours' Bristol express, while the latter was running funereally between signals in the neighbourhood of Cholsey! I have not had time to look through all my past records, but from memory I should say that the *large majority* of my up journeys along this route have been delayed by adverse signals at Didcot, and it does seem a pity that some efforts cannot be made to keep the road clear at least for the most tightly-timed trains.

Photo.] **GREAT NORTHERN RAILWAY.** [*L. H. A. Carr.*

Leeds to Cromer and Yarmouth train entering Wakefield (Kirkgate) station.
4-4-0 engine, No. 1328.

The down run, of which a somewhat more popular description than that which follows has already figured in one of the leading daily journals, is shown tabulated alongside a run on the same train timed by a Bath friend. The driver of *Knight of the Thistle* was W. Bunney, of Plymouth, and thoroughly well he managed the engine. We started in a fairly leisurely fashion from Paddington, not reaching 60 m.p.h. until Southall, but from there we steadily accelerated to 64 m.p.h. at Hayes, 67 at West Drayton, 69 at Langley, and a maximum of 72½ at Slough, where the engine was blowing off slightly. Thence we fell to 68 m.p.h. at Maidenhead, and 65 from Taplow to Sonning Cutting; after that we touched 69 m.p.h. at Reading and 70½ at Tilehurst, fell to 66 at Pangbourne, and were again running at 69 beyond Cholsey, when the unwelcome signals of Didcot claimed our attention. I do not think my allowance of 5 min. for this delay is excessive; it merely allows that otherwise the 18 miles from Cholsey to Uffington could have been covered, with a continuance of the same rate of progression, in a shade under 17 min. instead of the actual 21 min. 55 sec. Our rate of recovery from the check, which brought us down twice to a walking pace, was, however, rather slow. But after Swindon came another of those thrilling recoveries of time in which Great Western drivers seem to excel. The slight 1 in 660 which leads to the top of Dauntsey bank raised our speed to 72½ m.p.h., and the 1½ miles at 1 in 100 raised it further to 83·3; Chippenham we passed at 75 and Corsham at 66 (after

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6¾ miles up at 1 in 660), and a final rush through the 2 miles down at 1 in 100 of the Box Tunnel brought us out of the west portal at 81·8 m.p.h. Consequently our time for the 21·7 miles from Wootton Bassett to Bathampton was 17 min. 35 sec., which averages out at exactly 74 m.p.h., and our two slip coaches were left at Bath dead on time. Meanwhile Bunney did not slacken his effort in the slightest; we were up again to 68 m.p.h., on the level, on passing Keynsham, and then, enjoying the unusual luxury of a clear road into Temple Meads, we stopped precisely 3 min. early, in an actual time of 117 min. and a net time of 112 min. from Paddington. Congratulations to Driver Bunney on so fine a feat!

My friend's run, with a slightly heavier load, was unchecked and therefore of slightly less interest. The start was rather faster, as "even time" was attained at Reading as against Cholsey on my run; the 50 level miles between posts 6 and 56 were run in 45 min. 15 sec., at an average of 66·2 m.p.h., with a sustained maximum of 71·4 for 3 miles between Slough and Maidenhead. After Didcot, however, the driver eased his engine so markedly that the speed actually fell to 51½ m.p.h. near Shrivenham, and Swindon was passed a minute late. An average speed of 69·2 m.p.h. between mile-posts 86 and 106, however, sufficed practically to regain the loss, so far as the main train was concerned, although the slip arrived 22 sec. late. Maximum speeds on the concluding stretch were 74½ m.p.h. on Dauntsey bank and 76½ at Box.

The two up journeys, also tabulated—one of my own on the 5 p.m., and the other timed by the same friend on the 12 noon—were made with lighter loads. *Lady of Lynn* sustained 25½ m.p.h. on Filton bank (2 miles at 1 in 75), and accelerated from 47 to 52½ m.p.h. up the continuous 1 in 300 to Sodbury; *Corsham Court's* figures were also 25½ m.p.h., with 53½ m.p.h. at Sodbury. Badminton was passed at 54 and 53 m.p.h. respectively, and the highest subsequent speeds were 74 and 76½ m.p.h. *Corsham Court* suffered a slight signal check between Wootton Bassett and Swindon, but from there went ahead in great style, working up to 76½ m.p.h. at Wantage Road on a grade no steeper than 1 in 754; in fact, our average speed from Shrivenham to Steventon, 15·1 miles in 12 min. 15 sec., works out at almost exactly 74 m.p.h. So time was well in hand, and but for the appalling succession of checks from Didcot onwards, would have been kept to London easily, despite the slight slack near Swindon, and the necessary slack through Reading

SOUTH EASTERN & CHATHAM RAILWAY.

St. Paul's station, from the river bridge. Through main lines to Ludgate Hill to left.

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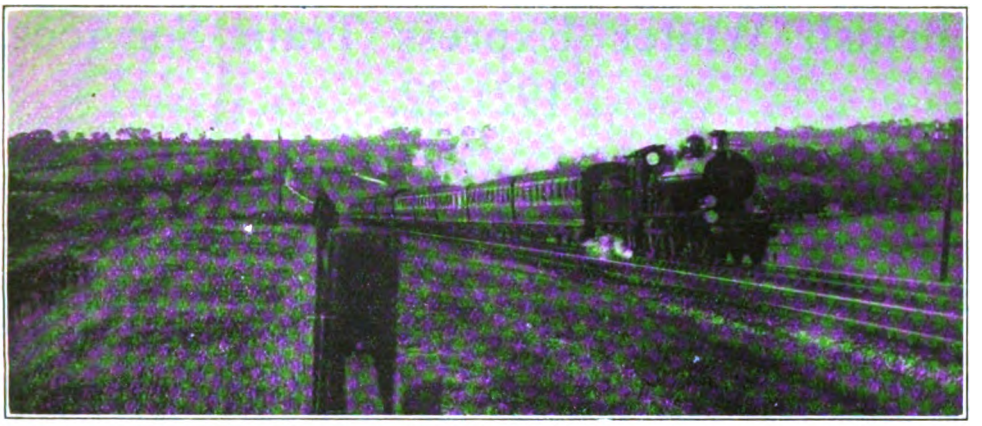

Photo.] **LONDON, BRIGHTON AND SOUTH COAST RAILWAY.** [*E. J. Morean.*

Victoria–Brighton express near Merstham.
Re-built 4–4–0 locomotive.

for the purpose of slipping the coach in the platform road, worth at least 2 min. *Lady of Lynn* had quite a placid trip, however, in its absence of signal delays, save for the slight one at Dolphin box: maximum rate before Didcot was 72 m.p.h., and speed was maintained evenly at about the "70" level on to Maidenhead, where the absolute maximum of 73 was reached. Thirty-six miles were covered at 70 m.p.h. or over; the 81·5 miles from Badminton to Slough were run in 72 min. 47 sec., at an average of 67·2 m.p.h.; while between posts 32 and 19 speed averaged 71·4 m.p.h. continuously, on a dead level track. After such good and uniform running, a very quiet finish was sufficient to effect a punctual arrival.

At this point I must conclude my notes. Not for want of material, seeing that I had hoped to pass on to the Birmingham route, where, *inter alia*, I have already secured two start-to-stop records of 59 min. 45 sec. and 59 min. 35 sec. over the 60·8 miles between High Wycombe and Leamington, one of 23 min. 55 sec. (by a "County" class 4-4-0) for the 23·4 miles from Birmingham to Leamington, and a net time of 67½ min. over the 67·5 difficult miles from Banbury to Paddington with a 315-ton train load! Parenthetically, I might mention that the London and North Western, not to be out-done, took me the other day over the 87¾ miles from Coventry to mile-post 6¼, start-to-stop, in 84¼ min., a "Claughton," with 222 tons, attaining 80½ m.p.h. at King's Langley! On the Great Western route "80's" are as plentiful as blackberries in the autumn; I have collected no less than *eight* in two return journeys to Birmingham! It is worthy of note that the present article incorporates some of the first fruits of the accession of Mr. Felix J. C. Pole to the highest executive post on the Great Western Railway, and at the same time marks the retirement of Mr. G. J. Churchward from the post of chief mechanical engineer. Without the enterprise of the former gentleman such runs as those I have described would not be available for description, and it is only the unique originality in design of the latter, during his long and honourable tenure of the post which he now vacates, that has provided Great Western drivers with locomotives capable, not only of observing the lightning times of pre-war days, but, as we have seen, of something considerably finer.

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British Winter Express Train Services, 1921-22.

By "VOYAGEUR."

LITTLE did the writer imagine, when gathering together and tabulating the statistical particulars of the summer train services which appeared in the October issue, that circumstances would arise to compel him to undertake all the labour over again, less than two months later. Such, however, were the nature and extent of the accelerations to express train services which came into operation on October 3 last that it is impossible to leave the Summer Service article as fully representative of British travel facilities in 1921; hence the genesis of the present article, which goes to set out, for the first time on record, a winter train service of far greater merit than the summer service which has immediately preceded it.

It is the Great Western Railway, of course, to which the greatest credit accrues, in a reversion absolutely to pre-war schedules, despite the fact that those times embodied, even in pre-war days, many of the finest daily speed exploits in the country. Practically the same might be said of the Great Central Railway, except that the very limited measure of deceleration adopted by this company as a result of war conditions has required a correspondingly limited cut in express train schedules to return to a pre-war level. Moreover, we have the remarkable winter time-table of the Midland Railway—in the *average* of its long-distance journey times within an ace of pre-war standards, and in the systematic arrangement of its trains a considerable advance on them—not to mention the lavish and rapid London-Birmingham two-hours' service reinstated by the London & North Western Railway, in addition to that of the Great Western Company. And, in reviewing these changes, one is forced to the conclusion that this outbreak of railway enterprise is not wholly unconnected with the removal of the "dead hand" of Government control, which took effect from August 15 last.

It must, however, be emphasised that present and pre-war running conditions are *not* the same. Locomotive maintenance is still below pre-war standards, and is likely to remain so for some time to come. Worse than that, coal is of inferior quality, and poor coal makes all the difference to the men on the footplate in working fast and heavy trains, where every ounce of steam that the boiler can produce is needed for timekeeping. All the more honour, then, to those railway companies which have now restored to us practically the full facilities of pre-war travel, not omitting also to mention those—such as the South Eastern & Chatham and London, Brighton & South Coast—that have been running a pre-war service for some time past.

In considering the tabular matter in detail, we start first with Table A, which, in default of a better method of comparison, indicates the fastest times in operation between London and the principal provincial towns, as a measure of the speeds run in general all over the country. If anything, this method operates rather to the disadvantage of the times of to-day, as the general tendency is now to operate long-distance services on standard end-to-end schedules, which admit of a certain number of intermediate stops; consequently, a "standard" time in some cases compares unfavourably with the "minimum" time of some pre-war crack express making a long non-stop journey. A notable example of this is Leeds, on the Great Northern Railway; before the war the 2 p.m. up express, non-stop from Wakefield to King's Cross, completed the journey in 3 hr. 25 min., against the present standard of 4 hours, whereas there is nothing like the same disparity between *average* pre-war and present Great Northern times. Taken generally, however, this

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TABLE A.—FASTEST WINTER TIMES BETWEEN LONDON AND PROVINCIAL TOWNS, IN 1914, 1918 & 1921.

Town.	Distance	Fastest time. Oct., 1921.	Railway.	Direction.	Fastest times. Apl., 1914.	Fastest times. Oct., 1918.	Increase, 1914–1918.		Increase, 1914–1921.	
	miles.	h. m.			h. m.	h. m.	h. m.	p.c.	h. m.	p.c.
Aberdeen ..	523½	12 15	East Coast Rlys.	Up	11 20	13 30	2 10	19.2	0 55	8.1
,, ..	540	12 30	West Coast Rlys.	Both	11 28	N.S.	—	—	1 02	9.0
Birmingham	110½	2 00	G.W.R.	,,	2 00	2 30	0 30	25.0	*Nil.*	0.0
,,	113	2 00	L. & N.W.R. ..	,,	2 00	2 30	0 30	25.0	*Nil.*	0.0
Bournemo'th	108	2 15	L. & S.W.R. ..	Down	2 00	2 35	0 35	29.2	0 15	12.5
Bradford ..	193¾	4 15	G.N.R.	Both	3 48	4 50	1 02	27.2	0 27	11.8
,, ..	203½†	4 42†	Midland Rly. ..	Up	4 10‡	5 55	1 45	42.0	0 32	12.8
,, ..	208	4 54	G.C. & L.Y. Rlys.	Down	4 42	5 00	0 18	6.4	0 12	4.3
Brighton ..	51	1 00	L.B. & S.C.R. ..	Both	1 00	1 15	0 15	25.0	*Nil.*	0.0
Bristol ..	118½	2 00	G.W.R.	,,	2 00	2 15	0 15	12.5	*Nil.*	0.0
Cambridge ..	55¾	1 18	G.E.R.	Up	1 11††	1 19	0 08	10.3	0 07	9.0
Cardiff ..	145¼	2 53	G.W.R.	Down	2 50	3 10	0 20	11.8	0 03	1.8
Carlisle ..	299	6 03	L. & N.W.R. ..	,,	5 51	6 45	0 54	15.4	0 12	3.4
,, ..	309	6 23	Midland Rly. ..	,,	6 20	7 28	1 08	17.9	0.03	0.8
Edinburgh ..	393	8 30	East Coast Rlys.	Both	7 50	9 40	1 50	23.4	0 40	8.5
,, ..	400	8 30	West Coast Rlys.	Up	8 15	N.S.	—	—	0 15	3 0
,, ..	407¼	9 09	M. & N.B. Rlys. ..	Down	8 40	10 44	2 04	23 8	0 29	5.6
Eastbourne ..	65¾	1 30	L.B. & S.C.R. ..	Both	1 25	1 42	0 17	20 0	0 05	5.9
Exeter ..	173¾	3 00	G.W.R.	,,	3 00	3 30	0 30	14.3	*Nil.*	0 0
,, ..	171¾	3 35	L. & S.W.R. ..	Down	3 18	3 57	0 38	19.2	0 17	8 6
Folkestone ..	70	1 25	S.E. & C.R. ..	Both	1 29‡†	2 00	0 31	34.8	—0 04	—4.5
Glasgow ..	401½	8 30	West Coast Rlys.	,,	8 15	9 30	1 15	15.2	0 15	3.0
,, ..	424½	9 05	M. & G.S.W. Rlys.	Down	8 55	10 40	1 45	19.6	0 10	1.9
,, ..	440¼	9 45	East Coast Rlys.	,,	9 35	N.S.	—	—	0 10	1.7
Harrogate ..	204¶	4 40¶	G.N. & N.E. Rlys.	Up	4 05**	5 20	1 15	30.6	0 35	14.3
,, ..	214¼	4 55	Mid. & N.E. Rlys.	Down	4 30	6 05	1 35	35.2	0 25	9.3
Hastings ..	62¼	1 30	S.E. & C.R. ..	,,	1 30‡‡	1 54‡‡	0 24	26.7	*Nil.*	0.0
Hull ..	196¾	4 20	G.N. & N.E. Rlys	Up	3 52	4 55	1 03	27.2	0 28	12.1
Inverness ..	567¾	14 10*a*	West Coast Rlys.	Down	13 35	15 55	2 20	17 2	0 35	4 3
,, ..	558¾	14 40§§	East Coast Rlys.	,,	13 35	N.S.	—	—	1 05	8.0
Leeds ..	196	3 55	Midland Rly. ..	,,	3 55	4 47	0 52	22.1	*Nil.*	0.0
,, ..	185¾	4 00	G.N.R.	Both	3 25	4 32	1 07	32.7	0 35	17.1
Leicester ..	99	1 47	Midland Rly. ..	Down	1 45	2 15	0 30	28.6	0 02	1.9
,, ..	103	1 49	G.C.R.	,,	1 49	1 56	0 07	6.4	*Nil.*	0.0
Liverpool ..	192¼	4 00	L. & N.W.R. ..	Both	3 35	4 45	1 10	32.6	0 25	11 6
Manchester	189½	3 56*x*	Midland Rly. ..	,,	3 40	5 08	1 28	40.0	0 16	6.8
,, ..	183½*	4 00	L. & N.W.R. ..	,,	3 30	4 35	1 05	31.0	0 30	14.3
,, ..	212‖	4 25	G.C.R.	,,	4 10	4 45	0 35	14.0	0 15	6.0
Margate ..	74	1 30§	S.E. & C.R. ..	,,	1 30	2 03	0 33	36.7	*Nil.*	0.0
Newcastle ..	268½	5 35	G.N. & N.E. Rlys	Up	5 20	5 55	0 35	10.9	0 15	4.7
Norwich ..	115	2 37	G.E.R.	Down	2 37	2 54	0 17	10.8	*Nil.*	0.0
Nottingham	123½	2 15	Midland Rly. ..	,,	2 15	2 55	0 40	29.6	*Nil.*	0.0
,, ..	126½	2 16	G.C.R.	,,	2 23	2 27	0 04	2.8	—0 07	—4.9
Parkeston Quay	69	1 22	G.E.R.	,,	1 22	2 04	0 42	50.1	*Nil.*	0.0
Penzance ..	305¼	6 30	G.W.R.	,,	6 35	7 55	1 20	20.3	—0 05	—1.3
Perth ..	449¾	9 45‖‖	West Coast Rlys.	,,	9 30	11 05	1 35	16.7	0 15	2.6
,, ..	440¾	10 10	East Coast Rlys.	Up	9 09	N.S.	—	—	1 01	11.1
Plymouth ..	225¾	4 07	G.W.R.	Down	4 07	5 00	0 53	21.5	*Nil.*	0.0
Portsmouth T	85¾	1 56	L.B. & S.C.R. ..	,,	2 00	2 38	0 38	31.7	—0 04	—3.3
,,	73¼	1 58	L. & S.W.R. ..	Both	1 46	2 12	0 26	24.5	0 12	11.3
Sheffield ..	164¾	3 06	G.C.R.	Down	2 57	3 22	0 25	14.1	0 09	5.1
,, ..	158¼	3 17	Midland Rly. ..	Up	3 03	4 01	0 58	31.7	0 14	7.7
Southampton	79½	1 32	L. & S.W.R. ..	Both	1 38	1 43	0 11	11.2	—0 06	—6.1
Stoke-on-Trent	145½	2 50	L. & N.W.R. ..	Up	2 41	3 21	0 40	23.5	0 09	5.3
Whitehaven	311	7 55	L.N.W. & Fur. R.	,,	7 45	9 05	1 20	17.2	0 10	2.2
York ..	188	3 47	G.N.R.	,,	3 35	4 00	0 25	11.6	0 12	5.6

† Via Leeds. ‡ Via L. & Y.R. and Thornhill, 198 miles. * Shortest route, via Stoke.
‖ Central Station. § Sundays only; fastest time on weekdays, 92 min.
†† Ex-St. Pancras, 56 miles. ¶ Via Arthington and Leeds (Central).
‡‡ Ex-Cannon Street, 1¼ miles less in distance. ** Via Church Fenton, 198¾ miles.
a 20 min. more after October 17. §§ 25 min. more after October 17.
‖‖ 30 min. more after October 17. *x* Working time; published time, 4 hrs.

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TABLE B.—WINTER RUNS OF 100 MILES OR OVER PERFORMED WITHOUT INTERMEDIATE STOPPAGE.

Railway.¶	Runs between	Distance.	No. of runs.	Fastest			Total No. of runs daily.		
				Time.	Train.	Speed.	1914	1918	1921
		Miles.		Min.		m.p.h.			
L. & N.W.R. (192.3)	Euston–Chester ..	179.2	c	213	8.45 p.m., D	50.5	39	10	27
	Euston–Crewe ..	158.1	8	177	10.20 a.m., D	53.6			
	Crewe–Carlisle ..	141.0	5	168	1.15 p.m., D	50.4			
	Stoke–Willesden Jctn.	140.5	1	157	1.15 p.m., U	53.7			
	Euston–Stafford ..	133.6	3	149	12.41 p.m., U 6.51 p.m., U	53.8			
	Euston–Birmingham	112.9	9	120	9 trains, U & D	56.5			
	Wigan–Carlisle ..	105.2	1	131	12.07 a.m., D	48.2			
G.W.R. .. (225.7)	Paddington–Plymouth	225.7	1	247	10.30 a.m., D	54.8	27	6	21
	Newton Abbot–Paddington	193.9	1	205	12.25 p.m., U	56.8			
	Paddington–Exeter ..	173.7	2†	†180	12.00 noon, D 1.45 p.m., U	57.9			
	Paddington–Taunton	142.9	1*	150*	11.00 a.m., U	57.2			
	Paddington–Newport	133.4	5	153	3.35 p.m., D	52.3			
	Paddington–Worcester	120.5	1	130	1.30 p.m., D	55.6			
	Paddington–Bristol (*a*)	118.3	1	120	11.00 a.m., D	59.2			
	Bristol–Paddington (*b*)	117.6	2	120	12.00 noon, U 5.00 p.m., U	58.8			
	Paddington–Birmingham	110.6	2	120	10.40 a.m., D 2.20 p.m., D	55.3			
	Paddington–Bath ..	106.9	4‡	109‡	1.00 p.m., D	58.8			
	Reading–Taunton ..	106.9	1	115	2.49 p.m., D	55.8			
G.N.R. .. (175.7)	King's Cross–Grantham	105.5	14§	121	5.30 p.m., D	52.3	15	6	14§
N.E.R. .. (124.4)	Newcastle–Edinburgh	124.4	10††	147	11.18 a.m., D	50.8	4	3	10††
Midland Rly. (162.0)	St. Pancras–Nottingham	123.5	3	135	9.00 a.m. 1.20 p.m. 5.00 p.m. } D	54 9	7	—	6
	Trent–St. Pancras ..	119.8	1	130	5.40 a.m., U	55.3			
	Leeds–Carlisle.. ..	113.0	2	135	3.53 a.m., D	50.2			
G.C.R. .. (164.7)	Marylebone–Leicester (*c*)	107.6	1	114	6.20 p.m., D	56.6	3	2	3
	Marylebone–Leicester (*d*)	103.1	3	109	3.20 p.m., D	56.8			
Caledonian R. (111.0)	Carlisle–Glasgow ..	102.3	2	140	‖4.10 p.m., D	43.8	2	—	2
L. & S.W.R. (108.0)	—	—	—	—	—	—	3	—	—
Totals ..	—	—	83	—	—	—	100	27	83

¶ Figures in brackets in this column indicate longest run (miles) in April, 1914.
(*a*) *Via* Bath. (*b*) *Via* Badminton. (*c*) *Via* Wycombe. (*d*) *Via* Aylesbury.
† Also slip coach off 10.30 a.m. in same time.
* Also slip coach off 10.30 a.m. in 149 min. = 57.6 m.p.h.
‡ Also slip coach off 11.00 a.m. in 105 min. = 61.1 m.p.h.
‖ Includes conditional stop at Symington on this train, frequently made.
§ Two less after October 31. †† Three less after October 31.
c Conditional run of first portion of 8.45 p.m. Irish boat express, when required, not included in totals.

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form of comparison is the easiest to make and gives a fairly satisfactory indication of the relative facilities afforded.

It is interesting, first of all, to compare, on a percentage basis, the ultimate slowing of train services which had taken effect on different railways at the time of the Armistice, and the recovery from then until the present date. To make this comparison more effective, I have introduced several additional towns into the table, in order to secure a better representation for the railways of the south and east. No company, therefore, has an average based on less than three figures. Calculated from the table, the average percentage of the deceleration from 1914 until October, 1918, was as follows :—

	Per cent.	Min. per hour.
Great Central Railway ..	8·7	5¼
West Coast Railways ..	16·4	9¾
Great Western Railway ..	17·6	10½
East Coast Railways ..	17·8	10¾
London & South Western Railway	21·0	12½
Great Eastern Railway	23·7	14¼
London & North Western Railway	24·1	14½
Great Northern Railway	24·7	14¾
London, Brighton & South Coast Railway	25·6	15¼
Midland Railway ..	29·1	17½
South Eastern & Chatham Railway	32·7	19½

The average of the whole table works out at a deceleration of 22·4 per cent., or 13½ min. per hour of pre-war journey time. By the summer of 1920 this had been reduced to 13·6 per cent.; the summer of 1921 saw a further reduction to 8·6 per cent., and now we come down to a mere 4·6 per cent., or 2¾ min. per hour, divided up between the different companies as follows :—

	Per cent.	Min. per hour.
South Eastern & Chatham Railway	−1·5	−1
Great Western Railway ..	0·0	0
London, Brighton & South Coast Railway	0·9	½
Great Central Railway ..	2·1	1¼
Great Eastern Railway	3·0	1¾
West Coast Railways ..	4·4	2½
Midland Railway ..	4·7	2¾
London & North Western Railway	6·1	3½
London & South Western Railway	6·5	4
East Coast Railways ..	7·0	4¼
Great Northern Railway	13·4	8

The most striking feature of these two tables is the way in which the South Eastern & Chatham Railway has leaped up from the bottom place in the first to the top place in the second, with a service which is now without question in advance of that of pre-war days. Another point which cannot escape notice is the present position of the Great Northern Railway, at the foot of the present-day percentages, with the East Coast Railways immediately above; some allowance may be made in the matter of Leeds and Bradford, as previously explained, but this alone is not sufficient to explain why the Great Northern Railway is the only line now showing a deficiency of over 10 per cent. in overall speed as compared with pre-war standards.

In Table A we notice that five of the towns tabulated can now show a faster service to or from London than in the pre-war period—Folkestone, Nottingham (Great Central), Penzance, Portsmouth (London, Brighton & South Coast) and Southampton. In 13 other cases present are equal to pre-war times; these are Birmingham (London & North Western and Great Western), Brighton, Bristol, Exeter (Great Western), Hastings, Leeds (Midland), Leicester (Great Central), Margate, Norwich, Nottingham (Great Central), Parkeston Quay and Plymouth. In regard to 10 other towns the maximum deficiency reached is only 3·4 per cent. That is to say, precisely half the places shown in the table have during this winter train services either faster, or as fast, or slower to an extent not greater than a purely nominal 2 min. per hour, than those which they enjoyed in the winter of 1913–1914. It took over four years of war to reduce the railways to the lowest level of war decelerations; but the recovery to the fine level of achievement which marks the October time-tables has been made in less than three years.

A unique feature of Table A is that the Midland Railway takes—so far as I know for the first time in history—the premier place in speed from London to both Manchester and Leeds. The 3 hr. 56 min. in the former case is the working time of the 2.25 p.m. down and the 9.47 a.m. (9.45, public time) up, over a route some 7 miles longer than the shortest route available to the rival company, and

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incomparably harder. Similarly, to Leeds the accelerated time of 3 hr. 55 min. of the 12.15 p.m. down "Scotsman" cuts 5 min. below the standard 4 hours of the Great Northern Railway, the discrepancy in distance this time being 10¼ miles in favour of the Great Northern Railway, while again the latter has far the better of it in regard to relative ease of running conditions. Further, the Midland beats the Great Central by the narrow margins of 2 min. in the case of Leicester and 1 min. in that of Nottingham, but fails by 6 min. two only. Of trains apparently, but not really non-stop on the London & North Western Railway, the 7.30 p.m. Euston-Crewe calls at Rugby (9.5–9.8), the 10.45 p.m. Crewe-Carlisle at Preston (11.46–11.49), and the 12.30 a.m. and 1.10 a.m. Carlisle–Crewe respectively at Carnforth and Preston (1.55–1.57 and 3.5–3.8) for traffic purposes only. There is one new run between Euston and Crewe, owing to the division of the summer 10.25 a.m. into two portions, the 10.20 for Liverpool, with a time to Crewe cut for

TABLE C.—FASTEST WINTER RUNS ON LEADING RAILWAYS IN 1913-14 AND 1921-22.

Railway.	In October, 1921.						In April, 1914 (e).
	Train.	From.	To.	Miles.	Min.	Speed.	Speed.
						m.p.h.	m.p.h.
G.W.R. ..	11.00 a.m. (f)	Paddington ..	Bath	106.9	105	61.1	59.4
L. & N.W.R.	12.45 p.m. (a)	Birmingham ..	Coventry ..	18.9	19	59.7	57.7
G.C.R. ..	1.07 p.m. ..	Princes Risborough	Brackley ..	27.8	29	57.5	61.3
Caledonian R.	4.35 p.m. ..	Forfar	Perth ..	32.5	34	57.4	57.4
Midland R.	5.49 p.m. ..	Kettering ..	St. Pancras ..	72.0	77	56.1	56.8
S.E. & C.R.	6.00 p.m. ..	Tonbridge ..	Folkestone ..	40.5	44	55.2	54.8
N.E.R. ..	9.25 p.m. ..	York	Darlington ..	44.1	48	55.1	61.7
L. & S.W.R.	5.25 p.m. ..	Basingstoke ..	Surbiton ..	35.8	39	55.1	57.2
G.N.R. ..	12.21 p.m. (b)	Grantham ..	Doncaster ..	50.5	59	54.1	57.5
G.N.R. (I.)	6.45 a.m. ..	Dublin	Drogheda ..	31.8	36	53.0	50.0
C.L.C. ..	14 trains ..	Manchester ..	Warrington ..	15.7	18	52.3	52.3
G.E.R. ..	10.19 p.m.	Shenfield ..	Prittlewell ..	20.7	24	51.8	52.9
L.B. & S.C.R.	5 trains† ..	Victoria ..	Brighton ..	51.0	60	51.0	51.0
G. & S.W.R.	5.12 p.m. (c)	Dumfries ..	Kilmarnock ..	58.1	69	50.5	54.6
N.B.R. ..	7.57 a.m. ..	Lenzie	Falkirk ..	15.5	19	49.0	52.3
L. & Y. R.	21 trains (d)	Liverpool ..	Manchester ..	36.5	45	48.7	54.7
G.S. & W.R.	5.37 p.m. ..	Maryborough ..	Dublin ..	51.0	63	48.6	51.9
N.S.R. ..	12.43 p.m.	Macclesfield ..	Stoke ..	19.8	27	44.0	44.0
G.N.S.R. ..	11.20 a.m.	Huntly ..	Aberdeen ..	40.8	56	43.7	43.8
Highland R.	6.14 p.m. ..	Blair Atholl ..	Perth ..	35.3	51	41.5	42.8

(a) And at 6.20 p.m. (b) And at 7.52 p.m. (c) And at 7.33 p.m.
(d) In both directions. (e) Not necessarily over the same route. (f) By slip carriage.

to "rope in" Sheffield as well. In several respects, however, the Midland time-table for October is entitled to rank as the most noteworthy of all those now under review.

Table B details the number of runs exceeding 100 miles in length made daily without intermediate stoppage. For the winter the London & North Western Railway changes places with the Great Western Railway, principally in view of the addition of nine daily non-stop runs between London and Birmingham, as compared with the Great Western Railway the first time since the war to below 3 hours, and the 10.30 for Manchester, Windermere, &c. The Great Western total may be less than that of the London & North Western, but obviously the quality is much higher, seeing that, if we cut out the Birmingham runs, all the rest of the Great Western Railway journeys but the five on the South Wales service are at average speeds well in excess of 54 m.p.h., whereas none of the other London & North Western runs so much as attain to that figure.

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The Great Northern and North Eastern 100-mile runs are over the two customary "courses," and show no advance in speed. But the Midland total of six is double that of the summer, owing to the inclusion of a new run from Trent to London and of non-stop runs in each direction between Leeds and Carlisle; furthermore, the average speeds maintained are very high. As usual, the Midland is unfortunate in this table in that 16 runs over the 99 miles between London and Leicester—only 6¼ miles less in distance than the London-Grantham "standard" run of the Great Northern Railway—escape inclusion by the narrow margin of 1 mile, while another run from Leicester to Leeds is only 3 miles short of the requisite figure. The Great Central & South Western Railway, of course, has not revived the Waterloo–Bournemouth and Waterloo–Christchurch "breaks" of pre-war days. Needless to say, a comparison of present winter 100-mile runs with the winter pre-war totals is much more favourable to the former than a summer comparison. It will be seen that we have now in operation a total equal to 83 per cent. of the 1914 winter total, runs are increased by one, in that the 2.15 p.m. from Manchester to London is now scheduled non-stop from Leicester to London; their total number is small, but the quality is of the finest. As the Great Eastern Railway has never had winter journeys exceeding 100 miles without intermediate stoppage, that company disappears from the table, and the London

TABLE D.—WINTER RESTAURANT AND PULLMAN CAR TRAINS IN 1914, 1918 AND 1921.

Railway.	Restaurant Car Trains.			¶ Tea Car Trains.	Pullman Car Trains.	Totals.		
	Worked.	Worked Jointly.	Worked by Foreign Cos.			Oct., 1921.	Oct., 1918.	April, 1914.
G.W.R.	55	—	10	5	—	70	—	85
L. & N.W.R. ..	46	§12	3	8	—	§69	—	69
Midland R. ..	45	4	—	—	—	49	20	53
L.B. & S.C.R. ..	—	—	—	—	46	46	20	42
G.E.R.	§34	—	1	—	22	§†46	4	28
Caledonian R. ..	—	14	—	—	‡27	41	—	20
L. & S.W.R. ..	33	—	1	4	—	38	12	24
N.E.R.	7	10	13	—	—	30	—	26
N.B.R.	18	6	2	—	—	26	—	26
S.E. & C.R. ..	—	—	—	—	26	26	—	16
G.C.R.	13	—	7	—	—	20	8	20
G.N.R.	10	10	—	—	—	20	—	22
L. & Y.R.	6	—	10	—	—	16	2	17
G.N.R. (I.)	6	—	—	4	—	10	8	4
Metropolitan R. ..	—	—	—	—	10	10	—	10
G. & S.W.R. ..	4	4	—	—	—	8	2	8
G.S. & W.R. (I.)	4	—	—	—	—	4	—	4
D. & S.E.R. (I.) ..	2	—	2	—	—	4	—	4
M.G.W.R. (I.) ..	2	—	—	—	—	2	—	2
Cambrian R. ..	—	—	—	2	—	2	—	—
N.C.C. (I.)	—	—	—	—	—	—	—	2
*Grand Totals ..	285	30	—	23	131	†458	72	405

* These totals do not include the same cars more than once when they run over more than one system.

‡ Includes 13 restaurant car services, first and third-class, operated by Pullman Co

¶ Trains in which teas are served from a small compartment kitchen, and not in a restaurant car.

† Total reduced by 11, in that 11 trains carry both Pullman and restaurant cars in their formations.

§ From November 1st.

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which is an exceedingly creditable figure in view of the difficulties occasioned in working by the eight-hour day.

There are so few changes to be made in the table of longest runs made by railways not attaining the "100-mile" standard that it is not worth while occupying space with a revision of this table. Consequently, we pass to Table C, which deals with the ever-interesting subject of fastest start-to-stop runs on each of the leading railways. The Caledonian Railway, which for some time past has occupied the leading position in this table, is now passed by three companies—the Great Western, London & North Western, and Great Central. The first-mentioned easily takes premier place with the first "mile-a-minute" run to reappear since the war. The London & North Western Railway only falls short of the same standard by the merest fraction, and, curiously enough, by the same two trains that figured in the summer table. The Great Central run is one of those smart short-distance "snippets" in which that company specialises. Below this level there are but few changes. The North Eastern Railway moves "up one," owing to the fact that the 5.30 p.m. from King's Cross now starts from York Station instead of Clifton Junction, but has no extra time allowed. The Great Eastern goes "down one," and the Cheshire Lines Committee "up two," in virtue of changes in the *venue* of their best respective speed exploits.

Table D gives the customary particulars as to restaurant and Pullman car trains, and here we see a really substantial advance, even on pre-war winter figures, there being 53 more such trains in operation in October, 1921, than in April, 1914—an increase of over 13 per cent. The great expansion of Pullman car business is more than responsible for this extension of the comforts of travel; a total of 66 Pullman car trains at the former date has expanded to 131 trains, or almost exactly double. Neither the Caledonian nor Great Eastern Railways had Pullman cars in operation during the winter 1913–14, and both lines now have a well-developed and extensive Pullman car business. As compared with the summer table, the Midland Railway displaces the Great Eastern in the totals, and resumes its customary third place, after the Great Western and London & North Western Railways. The Great Eastern falls level with the Brighton, and the fine totals of the two last-mentioned lines are, as always, highly creditable, in view of the disparity in size and class of traffic between them and the three companies at the head of the table. Elsewhere in the table there is little to report. There is considerable increase in "foreign" workings, additional to those of the summer; a third pair of workings, Great Western and North Western alternately, plies between Liverpool and Plymouth; a Great Western car and a North Eastern car work alternately between York and Swindon on the Aberdeen-Penzance service, and affect the North Eastern, Great Central and Great Western lines; the reinstated service, Great Central and London & South Western on alternate days, runs between Bournemouth and York; while a new alternate Great Western and Great Central service runs between Oxford and York, adding to the totals on the London & South Western, Great Western, Great Central and North Eastern lines.

The slip coach table I have not redrafted, as the only material alteration to the figures of the summer is an addition of eight to the Great Western totals, principally on the Birmingham route. There is one extra slip coach at Reading, one at Maidenhead, two at Bridgwater, one at Exeter, one at Bicester and three at Banbury, with one less each at Westbury, Taunton and Princes Risborough. To the Brighton total one is added, at Croydon, and the location of the one daily Great Central slip is altered from Brackley to Woodford. The total of slip coaches detached daily, therefore, increases from 60 in the summer to 67 in the winter (the withdrawal of the Great Northern of Ireland slip at Lisburn and the Eskdale Railway slip involves a reduction of 2), as compared with 9 in October, 1918, and 178 in April, 1914, so that in this particular direction there is much leeway to be made up. But in general the winter time-tables afford most striking evidence of the determination of British railway companies to spare no effort in restoring to the public that speed and comfort of express train services to which we had become accustomed in the halcyon days before the war.

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"Quintuple" Restaurant Car Trains,

GREAT NORTHERN RAILWAY.

FOR some years now Mr. H. N. Gresley, C.B.E., Chief Mechanical Engineer, has been constructing rolling-stock on the "twin" principle, and besides a number of older six-wheeled coaches which have thus been brought up-to-date by carrying two bodies on three bogies, three bodies on four bogies, and similarly for quadruple and quintuple sets, he has constructed suburban bogie sets on this system, since converted into four-body five-bogie units. The system has proved entirely satisfactory in extended service, and Mr. Gresley has now further developed his practice in this connection by introducing five-body six-bogie restaurant car sets for the London-Leeds service which, besides incorporating the "twin" principle, may be regarded as the latest example of restaurant car train design and equipment on the Great Northern Railway.

It is interesting to note that the first dining car to be run on a British railway was provided on the Great Northern Railway Company's London and Leeds service so long ago as 1879. This initial step was followed by continual development of the train service and increased facilities to ensure the comfort of passengers. At the present time all the express trains between London and the West Riding of Yorkshire are composed of up-to-date bogie vehicles, and are provided with first and third-class breakfast, luncheon or dining cars, the new sets representing the highest development yet realised.

The first of the new trains is now daily forming part of the 10.10 a.m. King's Cross to Leeds (due 2.10 p.m.), returning from Leeds at 5.30 p.m. (due King's Cross 9.30 p.m.).

Built on the "articulated" principle, the train consists of five carriages carried on six bogie trucks only. By this arrangement the riding of the train is improved, oscillation is reduced to a minimum, and the weight of the train is considerably reduced, an important point, as the cost of haulage is thereby lessened.

The composition of the train and the lengths of the respective vehicles are as follows :—

First-class brake	55 ft. 2½ in.
First-class dining car... ..	45 ft. 11 in.
Kitchen and pantry car ...	37 ft. 6 in.
Third-class dining car ...	45 ft. 11 in.
Third-class brake	55 ft. 2½ in.

The train can be strengthened by the addition of ordinary corridor carriages at either end as necessary.

The train is vestibuled throughout, the connections differing from those hitherto employed, the distance between the carriages being so much shorter that a permanent connection can be made which is weatherproof and draughtproof. Owing to the absence of the usual connections, couplings, &c., the noise and clatter which is necessarily associated therewith is obviated.

Articulated or "twin" coaches, as already mentioned, have long been familiar on the Great Northern Railway, but this is the first dining car set which has been constructed on that principle and is the longest unit of its kind running.

Special attention has been paid to the ventilation of the train. The dining cars are provided with large plate glass windows 4 ft. wide, which passengers can lower or raise by means of a handle fixed above the table in front of the window. Above these windows are provided two small fanlights, which open outwards and are under the control of the passengers. Instead of fans being fixed in the usual position on the end partitions of the dining cars, electric extractor fans are provided in the roof of the carriage. In addition to these, the usual torpedo ventilators are provided, which can be opened or closed at will by means of handles conveniently situated on the side panels.

Semi-indirect electric lighting is provided in the dining cars, the lamp fittings being placed in the centre of the roof. The first-class saloon is provided with

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GENERAL VIEW OF FIVE-BODY SIX-BOGIE RESTAURANT CAR SET TRAIN, PLACED IN SERVICE BETWEEN LONDON AND LEEDS, GREAT NORTHERN RAILWAY.

Designed on Mr. H. N. Gresley's "Articulated" principle, and including the latest developments in restaurant car train practice.

alabaster bowls, 12 in. diam., and in the third-class saloon are fitted obscured glass bowls. Table lamps are also provided in the first-class saloon. Each of the bowls is provided with four 25 candle-power half-watt lamps, the total candle-power provided in the first-class dining saloon being 750 and in the third-class 600. The light is so diffused by means of the plain white roof and the indirect fittings that there is an entire absence of glare and all objectionable shadows are obviated. The lights throughout the unit can be controlled either from the guards' vans or by the dining car conductor.

The tendency in recent years in the decoration of dining cars and other railway carriages has been to make them more and more ornate, but in dealing with the scheme of decoration in the new train this tendency has been entirely reversed. The prevailing note in the whole scheme of decoration, both of the compartments and of the dining cars, is simplicity. No mouldings whatever have been used in the first-class dining car, and there is no decoration of any sort on the roof. The walls of the car are lined with plain natural-coloured mahogany panels, the panels being made as large as possible so as to reduce the number of joints to a minimum, and neither carving, fluted moulding, nor even cornice mouldings are provided. The roof and ends of the dining saloons above the panels are also absolutely plain, being painted dead white. Usual hat racks and hat pegs are provided, and are all of the plainest possible design.

Full advantage has been taken of the width allowed by the loading gauge, and, in consequence, it has been possible to seat in the first-class carriages six persons in each section, two seats and one table being provided on one side of the gangway and four seats and one table on the other. In the third-class dining car eight persons can be seated in each section, each table being arranged for four passengers. Seats in the first-class compartment are of the armchair type, comfortably upholstered in green tapestry. Tables are of polished mahogany, and the tops are covered with green morocco leather. Each table has a loose cover of green leather, lined with green felt. The floor is covered with crimson Wilton pile carpet, and the lobbies

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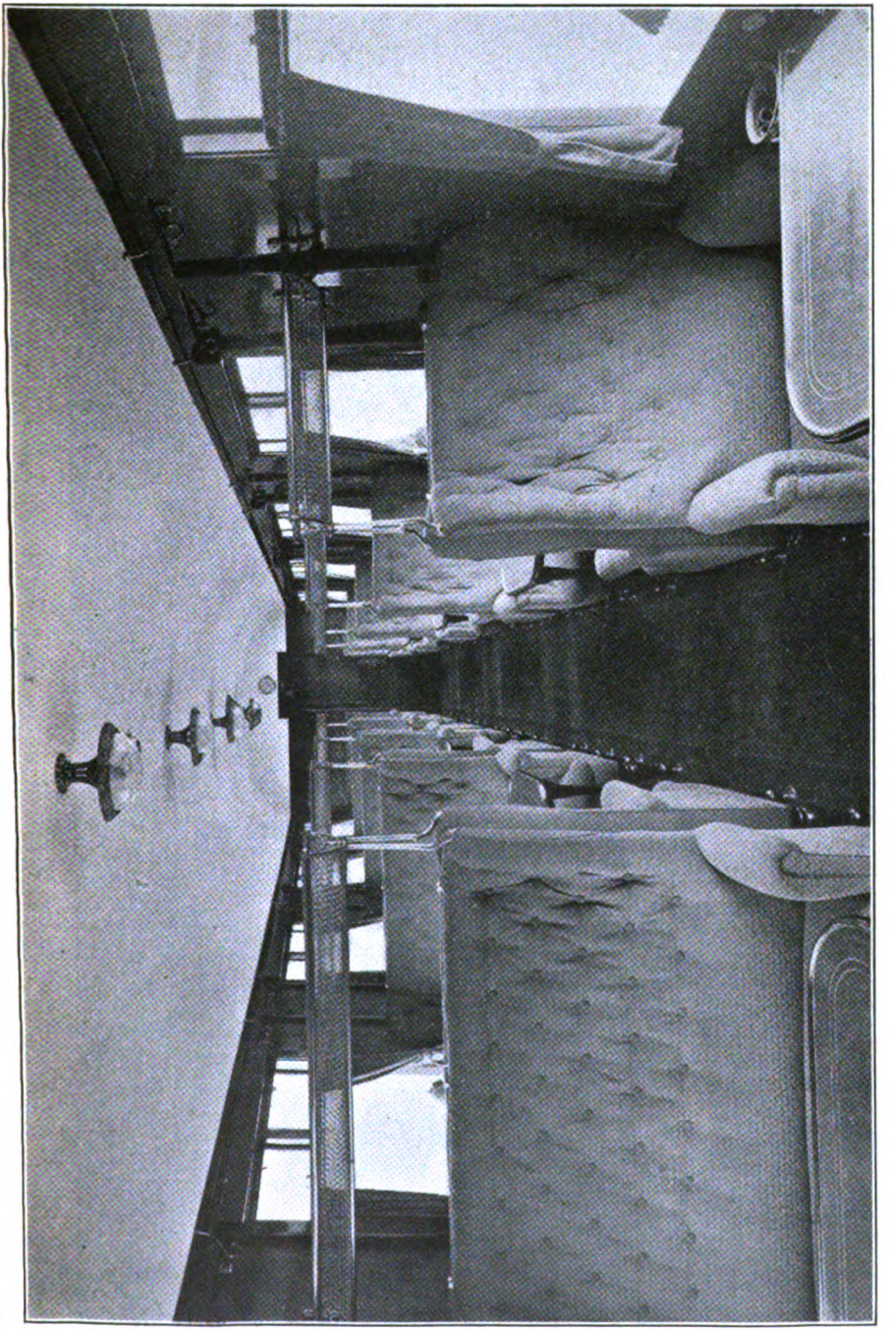

INTERIOR OF FIRST-CLASS DINING CAR.

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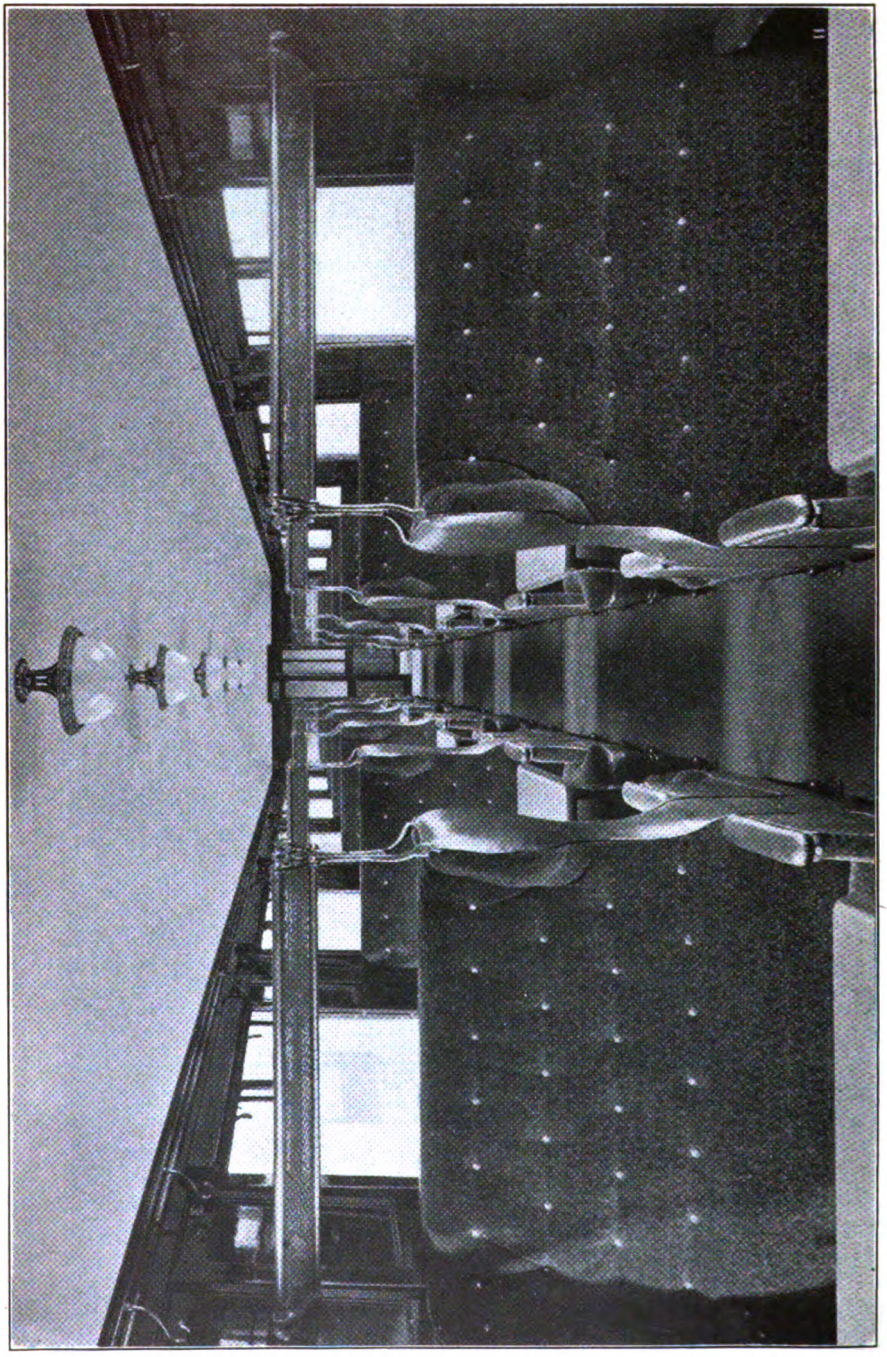

INTERIOR OF THIRD-CLASS DINING CAR.

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at each end are covered with green and white indiarubber tiling. The seats in the third-class dining car are also of the armchair type, upholstered in crimson and black pile. The floor is covered with "Kork" linoleum.

The new train embodies many novel features, of which, perhaps, the principal innovation is the exclusive use of electricity for cooking, instead of gas, which is employed on all other dining cars.

The train comprises a well-appointed travelling restaurant in which luncheon or dinner can be served for 78 persons at the same time. Everything is prepared and cooked entirely on the train, the kitchen being provided with a complete equipment of electric cooking apparatus. While individual pieces of apparatus such as electric kettles, urns, food warmers, &c., are frequently used in railway carriages, this is the first dining car train on which the cooking is entirely done by electricity, and naturally the details of the application have required special consideration.

A brief description of the cooking apparatus will no doubt be of interest in view of the novelty of the application, the credit of which is due to the enterprise of the Chief Mechanical Engineer, Mr. H. N. Gresley, C.B.E., under whose personal supervision the work has been carried out. The whole of the apparatus has been supplied by J. Stone and Co., Limited, of Deptford, London, whose well-known system of electric lighting is also fitted on the train.

In the interior of the kitchen the main cooking range is fitted across one end, and there is on the left a roasting oven, with steaming oven, grill and hot water tank superimposed. On the right are placed the boiler range with four hot plates for frying, boiling or heating sauces, &c., and two boiling pans of 10 gallons capacity for cooking vegetables, &c. On one side of the kitchen, between the serving hatches, the hot cupboard is fitted; this has sufficient capacity for heating the whole of the plates, &c., required for the service, and the top forms a convenient table. A separate fish fryer measuring 18 in. long by 11 in. wide by 7 in. deep is provided for use when required. A 2-gall. urn and two 6-pint kettles are available for boiling water for teas, and to supplement the supply from the boiler on the top of the oven range.

The need for adequate supplies of boiling water and hot water for washing up and other purposes constitutes a continuous demand on the available electrical energy. There is a 40-gall. tank for warm water fitted in the roof of the corridor alongside the kitchen, and heating elements are clamped to the underside of this tank. From the warm water in this tank the boiler on top of the oven range and the hot water urn are supplied, and this enables boiling water to be obtained much more quickly when required.

Control of the cooking equipment in the kitchen is arranged as conveniently as possible for the *chef*. A main throw-over switch on the switchboard enables the load to be switched over from the preliminary alternating current supply at the terminal station to the direct current supply from the battery and dynamos before leaving the terminal station. Subsidiary boards are provided for each main group or important element of the apparatus, carrying separate switches for the control and regulation of the heat of individual elements. Pilot lamps are set over the switches illuminating red glasses inscribed with the name of the apparatus in use so that at a glance an indication is obtained of the operations that are going on.

Electrical energy for operating the cooking apparatus while the train is under way is provided by two Stone dynamos, of "Lilliput" type, carried on the underframe of the kitchen car, supplemented by a battery of accumulators to enable cooking operations to be continued during intermediate stops. The dynamos are each of 6-kilowatt capacity with self-contained automatic pole changers, and are belt-driven from the axle of the carriage. Automatic switch gear is provided for the control of the machines, to connect them with the battery and the cooking equipment as soon as the machine is running at the pre-determined speed and disconnect them on falling below this speed. A battery overcharge preventing switch automatically diverts a portion of the current from the batteries as soon as the fully charged condition is reached, causing the voltage to rise above a certain point and operate the switch; the current

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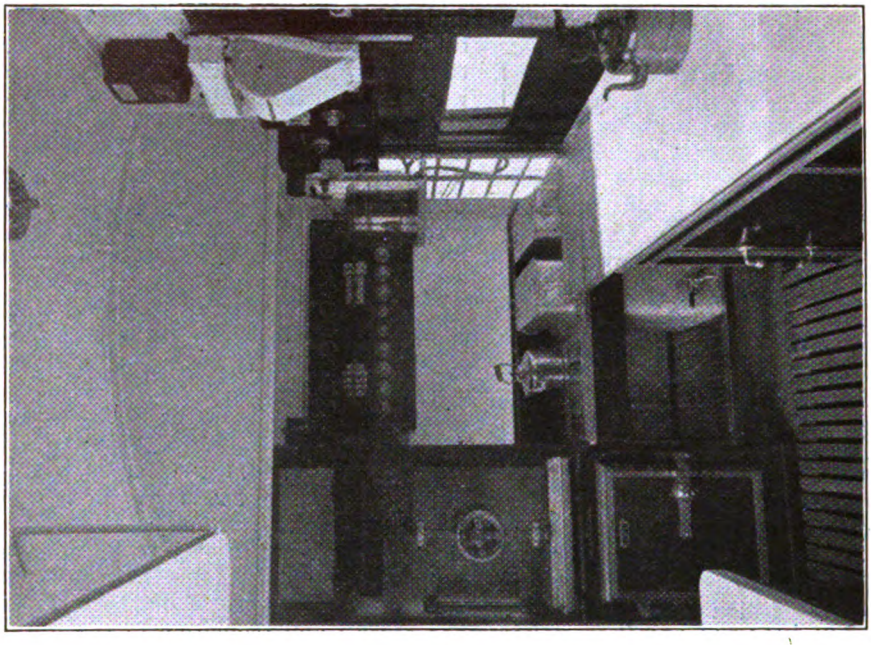

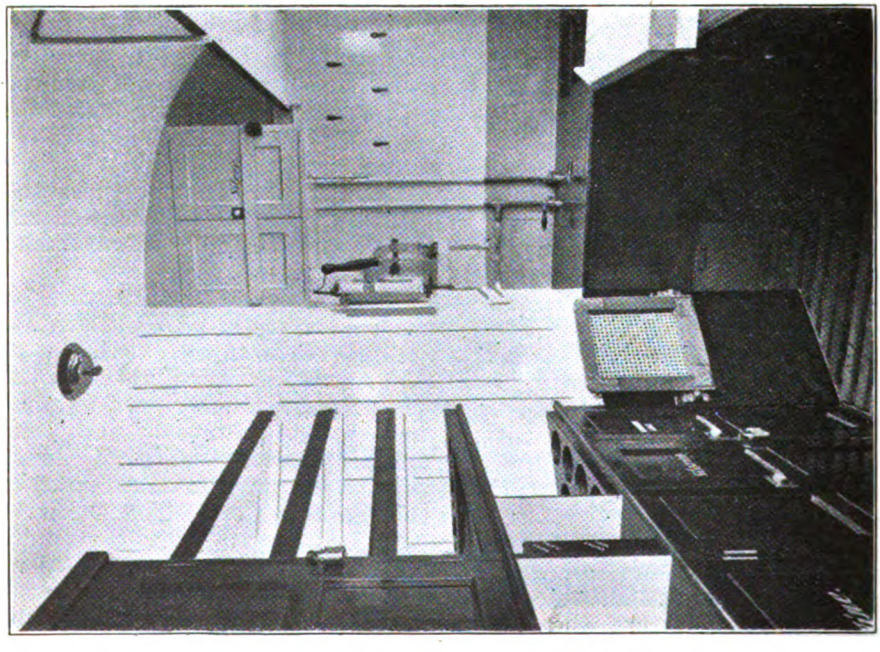

VIEWS IN KITCHEN SECTION, ALL APPLIANCES ELECTRICALLY HEATED.

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so diverted from the batteries is usefully employed by passing it through a supplementary heater applied to the warm water tank in the corridor.

The automatic cut-in switches and potential overcharge switches are of special design; to suit the voltage of the present application they are made with double pole switch brushes and carbon break on each pole, with other modification of detail as necessary to meet the special conditions. As a safeguard against an excessive load being imposed on the dynamos and battery while in service, an overload circuit breaker is fitted to operate when the current exceeds the normal running load, and before this will hold in (on the level being replaced) the load has to be reduced by turning off or reducing to lower heat one or other of the cooking elements. An ammeter and 3-way switch enables the output of either dynamo or the total load due to the apparatus in use to be raised at any moment; and an ampere-hour meter is fitted, indicating the state of charge of the battery.

The accumulators are small, only measuring 3 in. by $6\frac{3}{8}$ in. by $14\frac{3}{4}$ in., and are of light weight, high capacity type, 9-plate size, in ebonite boxes with lids sealed down. They have screwed vent plugs for access to the acid for taking gravity and refilling, &c. The battery comprises 80 cells, 10 cells in a crate, there being eight crates arranged in two boxes on the underframe. The weight of the complete battery is 1,880 lb. A link is provided at each battery box, and by disconnecting this link the battery circuit may be broken at an intermediate point, so that the potential difference at each battery box does not exceed 40 volts in any section while the apparatus is under examination. The main switchboard on which the throw-over switch is fitted carries four pairs of fuses for the main groups of apparatus, and fuses for the individual heating elements are carried on the subsidiary distribution switchboards.

The cooking range, ovens, boilers, &c., were made by the Jackson Electric Stove Company, to meet the special requirements of the installation. Wiring is carried in enamelled screwed conduits, which are earthed, as also are the frames or casings of the various cooking apparatus. The plug conditions for the electrical supply from the station mains are interlocked with a valve on the train pipe, a lever controlling this valve being so placed that while the plug is connected the valve is open and a vacuum cannot be created in the train pipe. Additional sockets are arranged for conveniently charging the battery at terminal stations, so that on emergency the batteries can be readily re-charged should they through any exceptionally heavy demands on the journey have been exhausted.

As a check against any accidental or unforeseen damage to the installation of the equipment, two indicating lamps are provided on the main switchboard connected in series between the mains. By switching on a tumbler-switch these are lit in series, and on pressing a button the intermediate connection between the two lamps is earthed; any considerable reduction in the insulation resistance of one pole of the circuit as compared with the other will be indicated by the difference in brightness of the two lamps.

The advantages of cooking by electricity in a railway train will be apparent to everyone, but special mention should be made of the better conditions from the point of view of cooler and purer atmosphere under which the *chef* is able to do his work. It is not perhaps generally known that meat which has been cooked electrically is claimed to be better cooked and more palatable and also more nutritious than meat cooked by gas, and this fact has led to this method of cooking in the high-class restaurants in London and the other capitals. It is also cleaner, and the temperature of an electric kitchen is much lower than that of a gas kitchen. The objectionable smell of gas is, of course, obviated.

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Traffic Working on the Midland Railway.

A description, in three parts, of the pioneer system of train control in Great Britain. All arrangements for the working of both passenger and freight traffic are centralised at Derby, and the distribution of rolling-stock is regulated by the Control staff.

III. PASSENGER TRAIN OPERATION.

By CHARLES TRAVIS, M.Inst.T., Joint Author of "Practical Railway Working."

NO more than two British railway companies control the whole of the important passenger trains all over the line. These companies are the Lancashire & Yorkshire and the Midland. It was in 1916 that the Midland decided to adopt the system, and a beginning was made, as from January 1, 1917, with the expresses. Instructions were issued to the 26 principal stations to report by telegraph the running of 54 expresses, and arrangements were also made for a return of the signal delays experienced by expresses and for two monthly statements, one showing minutes late in departure and arrival of expresses (each day), and the other showing total minutes delay (departure and arrival of expresses), and the average for the period. In the same month the extra vehicles to be conveyed by passenger train were brought within the scope of the control, and the 26 principal stations were instructed to forward a weekly statement showing actual minutes late in departure and arrival of all trains (except controlled expresses), and particulars of "extra" vehicles on express trains and piloting on expresses. Instructions regarding the control of passenger trains were laid down in a circular dated May 26, 1917, while a further circular issued on May 29, 1917, dealt with the methods to be adopted in connection with "extras" by passenger train. These instructions emphasised the fact that control orders were supreme and that authority from the control justified any change in the workings.

On the departure of an express train from one of the reporting stations a telegraphic message is sent to the Central Control, giving particulars in code form as to the number of the train, the time of arrival and departure, class of engine, tonnage and state of loading. The loading is indicated by means of a letter code, wherein L = light loading; Q = normal loading; Y = fully loaded; Z = full and standing. From these wires information is entered on the passenger train running sheets, which will be described later. In the case of trains arriving at destination, only the number of the train and the arrival time are given, there being 16 reporting stations concerned.

"Extra" Vehicles on Passenger Trains.

The working of all extra vehicles, that is, vehicles additional to those laid down in the scheduled marshalling arrangements, is controlled from Derby alone, and no vehicle must be attached to a passenger train in the absence of specific authority.

When stations are called upon to work traffic which necessitates the use of additional vehicles, they ask the Control Office (usually by wire) for a service and also for the special vehicles required (if any). As regards the service, a suitable one is selected and passed to the station with information as to whether the extra vehicles are to be attached in front or at the rear of the train, while the necessary particulars with regard to the extra vehicles are recorded on cards coloured white for "down" traffic and salmon for "up." These "extras" cards are transferred either to an "extras" board, of which there are three, or to a small cabinet (introduced on April 3, 1917), in which those cards not wanted for immediate use are sorted into date order in geographical sections.

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MIDLAND RAILWAY.
PASSENGER TRAIN ADVICE.

DY Station 9 12 1920 From WN To D

Prefix T.R.	Control No. (In figures)	Time (Hours) Arrival	Time (Hours) Departure	Class of Engine (In words)	Tonnage (In figures)	How Loaded (Code letter)	Vehicles Equal to (In figures)
Code CL	114	CGW	CHR	Two	111	Q	
No. of Words 30	109	CIS	CK	ONE	72	Q	
Head from LD / Circuit A	111	—	CKS	Two	102	L	
Time 4.5 P							
Clerk J							
Sent to / Circuit							
Time							
Clerk							

If lightly loaded ... L
If loading normal ... Q
If fully loaded ... Y
If standing ... Z

If train running in two portions, separate information required for each.

Add "R" preceding "Control No." to duplicates.

Time Signed

TELEGRAPHIC ADVICE OF TRAIN COMPOSITION, ENGINE CLASS AND LOADING.

Three "extras" boards are provided, one for express trains covering two days, and two for local and branch passenger trains, each board for a separate day. At midnight the "extras" board is cleared of the old cards and those for the following day placed in position. It might incidentally be added that 60 to 70 extras are required for theatrical traffic each Sunday, and special arrangements are made for their prompt working by the control.

In some cases a train cannot haul the extra vehicles without the assistance of a pilot. Arrangements are then made, whenever practicable, for the vehicles to be conveyed by other suitable trains, and, where this cannot be done, pilot engines are allocated to assist. In arranging such pilot workings for a certain train, a special pilot card is made out, white for "down" and salmon for "up," and this card is kept along with the "extras" card.

Apart from the records on the "extras" card, particulars of additional vehicles running on express passenger trains are entered in summary form on large cards. The cards for the current day's working are kept on the control table, so that the controller may be fully advised as to the arrangements. If from any unexpected cause there is some variation in the actua workings, information can promptly be obtained as to the reason and any necessary adjustments be made before the working of the trains is at all upset. The necessity for restrictive endorsements in the time-tables is, therefore, obviated.

Supervision of Passenger Train Running.

The means whereby, in the Control Office, the movement of express passenger trains and important perishable trains is watched consists of metal rails on a long table, laid out on the scale of 1 in. to the mile. The principal stopping places for express trains are shown on the table by small painted blocks representing the

M.R. Co. Friday Dec 10th 1920

DOWN TRAINS.

Train	From	To	Extras	Time	Traffic From	Traffic To	Position	Forward Working	Advice Sent to	Entered on Extras Card
5.35 p.m.	LN	LS	HB	8	LN (Shorncliffe)	LP (Melton)	Front	9.7	LN & LR	
			YCT	8	LN	LS (Dumfries)	"	1.53 a.m.	LN. LS.	
8.50 p.m.	LN	CE	YCT	8	LS (LN)	CE (Dumfries)	Front	G & SW	LS. CE. G & SW.	

"EXTRAS" CARD, SHOWING ADDITIONAL VEHICLES TO DOWN TRAINS ON DECEMBER 10, 1920.

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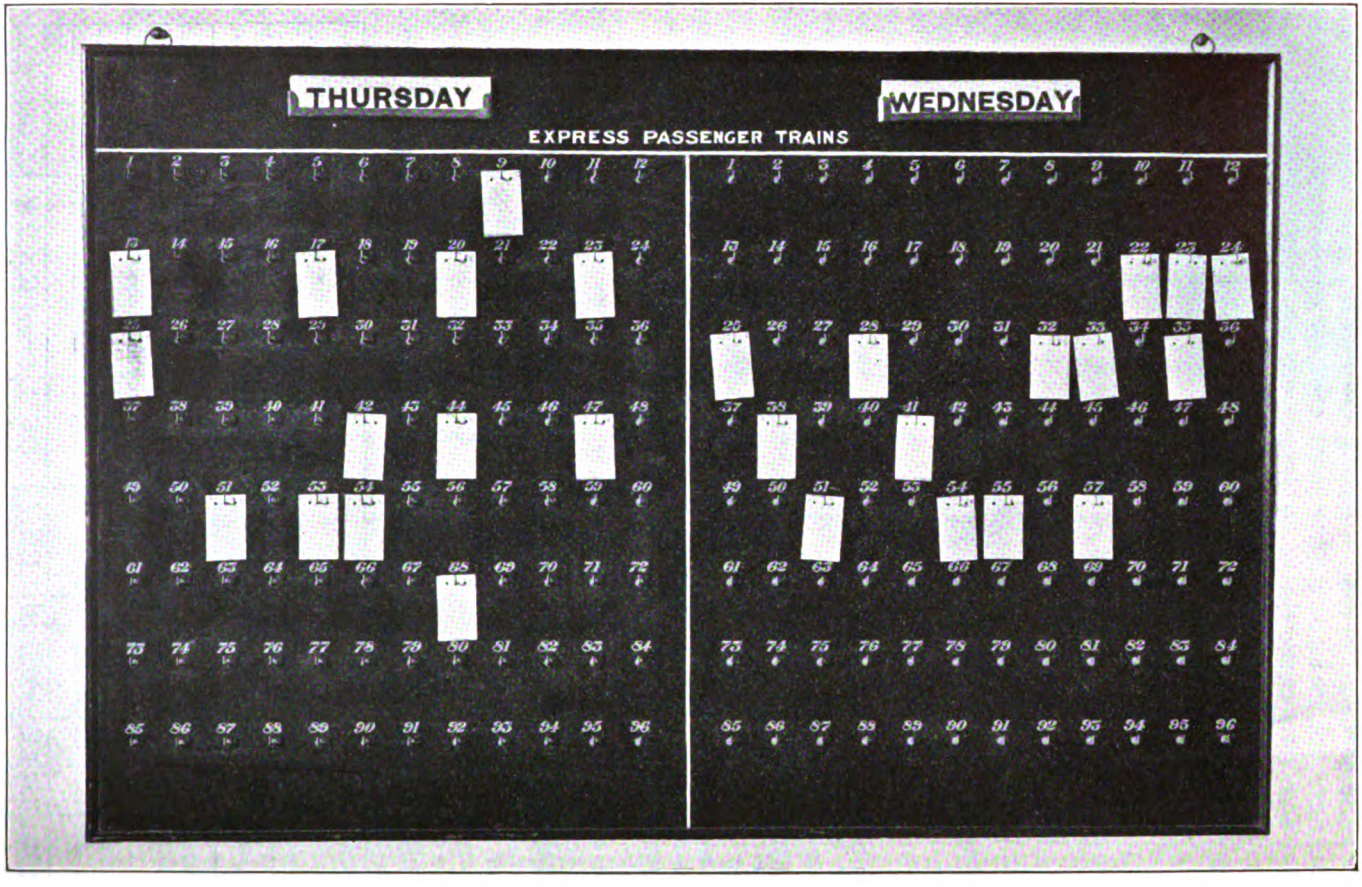

"EXTRAS" BOARD USED IN CONNECTION WITH EXPRESS PASSENGER TRAINS AT CENTRAL CONTROL OFFICE.

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stations. Clips are used to represent the trains, and are moved along the rails as the trains are reported. Each of the clips representing a train bears a prominent card at the top showing the number of the train represented, the commencing and terminating points, and places (if any) at which engines are changed *en route*. For example, the card for the 10.48 a.m. Leeds to London train would be a pink one, and would be endorsed :—

10.48 a.m.	LS–LN
Engines changed at	SD NM

and perhaps an additional card for " extra vehicles." Similarly, if an additional engine is working with the train, a further card bearing essential particulars is attached.

In addition to the movement of the clips along the metal rails a series of running records is maintained on large sheets, these being five in number. Up and down main line express passenger trains are recorded separately, as also are up and down trains north of Leeds, while up and down working between Bristol and Leeds is entered on a single sheet.

These sheets are kept on the control table, and particulars are entered up as the trains are reported from the various stations. Any delays are promptly taken up and information obtained in explanation. To show how effectively this is done, reference may be made to my own experience on proceeding from St. Pancras to Derby. I travelled on the 8.15 a.m., which arrived two minutes late through a delay just north of Bedford. On entering the control room almost immediately after arrival at Derby, I was able to ascertain the reason for the delay to the train in which I had travelled. This is of some importance, as those who are conversant with the complications of traffic arrangements know full well that prompt notification of delay is one of the surest remedies for such troubles.

A record of the important perishable trains, somewhat similar to that maintained in connection with passenger trains, is kept, and shows the running times, class of engine, number of vehicles, and weight in tons. This class of traffic, which it is essential should be worked with the utmost expedition, is not by any means easy to work satisfactorily, owing to the great variations in the amount of traffic offering.

Passenger Vehicles.

All coaching stock other than passenger-carrying vehicles is distributed on the same system as the specially constructed freight vehicles, and a separate series of indicators is maintained as a guide to the working. The formation of the passenger-carrying vehicles is, of course, laid down in a passenger train marshalling booklet, and, except in the case of mishap, no change must be made in these arrangements unless the authority of the Central Control has been obtained. In fact, the system is so fine that no " extra " vehicle, such as a horse box, must be attached to a passenger train until sanction has been given for this course.

The supply of horse boxes, motor vans, carriage trucks (open and covered) and prize cattle vans is regulated from the control office on application from any stations for the vehicles. Such applications are recorded on cards showing the description, number, to be sent to, to load to, remarks. The cards are kept in date order in a small cabinet, and are dealt with each night by the clerk on duty, who arranges the supply of the necessary vehicles and, in conference with the " extras " clerk on control work, decides the service by which the vehicles shall be sent to the points where they are required for loading. Whenever possible, it is arranged for the vehicles to be at such points the day before they are required.

So that the control office may be in a position to distribute passenger stock to the best advantage, telephonic information is sent by any Midland station on the arrival there of foreign horse boxes and other passenger train vehicles. For example, between January 26 and February 29, 1920, 401 foreign horse boxes and prize cattle vans were loaded to Midland stations. The prompt intimation of their arrival to the control office enabled 117 of these to be loaded home or in the homeward direction, and by this means approximately 7,000 empty miles were avoided.

Platform Occupation.

On the Midland system there are many stations with platforms insufficiently long

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to accommodate the lengthy trains now running, and delay was experienced by the practice of "drawing up." In the aggregate the time lost was very heavy, and the detention naturally affected many following and connecting trains. Arrangements to avoid this were put into operation in October, 1918. In some cases trains are booked to run the first two or three coaches beyond the platform; in other cases trains are arranged to stop with so many coaches at the rear of the platform.

Extracts from the arrangements for Christmas, 1920, are given below. Lists are prepared showing what must be done with every train which overlaps any platform, and instructions are then issued to trainmen and stations concerned to avoid drawing up.

Early in 1919 information was obtained from the various stations where station stops were beyond one minute, this showing full details of the work performed, and a general revision of the booked stops at stations was then taken in hand. The occupation of the main lines for terminating passenger trains, or one requiring to run round, or for any other purpose, was arranged in consultation with the control officials and stationmasters, and a series of station occupation diagrams were prepared. These have been found of great advantage, and have been prepared for the 12 principal stations on the line. Each stationmaster is supplied with a statement showing platform capacity, train, loading, vehicles equal to, from, minutes allowed, and instructions. All stations at which trains commence and terminate send in a weekly form showing the punctuality record of each such train and indicating the number of minutes late in starting or arrival, if any. These

7.50 A.M. SHEFFIELD TO BRISTOL.

Station.	Platform Capacity.	Vehicles equal to.	Mins. allowed.	Date.	Instructions.
Derby	--	15½	6	24	Derby to see that passengers and traffic for Repton and W. are conveyed in the front 5 bogies.
Repton and W. ..	8½	--	3	—	To note and see no drawing up takes place.
Birmingham ..	16½	18½	10	24	To see no Bromsgrove passengers or traffic in two rear vehicles.
Bromsgrove ..	15	--	6		To see no passengers or traffic in four front bogies for Droitwich and instruct trainmen to run them past platform.
Droitwich	12	--	2	—	To note and see no drawing up takes place.
Cheltenham ..	14½	--	5	—	To note.

NOTE.—All stations to see that traffic for Cheltenham is loaded in front portion of train.

12.15 P.M. LONDON TO MANCHESTER.

St. Pancras ..	—	19	--	24	St. Pancras to see no Bedford passengers or traffic in two rear vehicles.
Bedford	16½	--	5	—	St. Pancras and Bedford to see no passengers or traffic are in four front vehicles for Wellingborough and instruct trainmen to run these past Wellingborough platform.
Wellingborough ..	12	--	5	—	Wellingborough to note.

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forms are scrutinised by the passenger train controller, and, where necessary, he investigates the conditions personally or sends a deputy.

As a concrete instance of the utility of passenger train control reference may be made to an adjustment effected during my visit to Derby. On December 9, an extremely foggy day, the 1.15 p.m. express from Manchester to St. Pancras started very late, and, owing to the bad weather, was further delayed *en route* to Derby. The working was being closely watched by the passenger train controller, and as he ascertained that another train would arrive at Derby for London about the same time as the one from Manchester, and that both trains were lightly loaded, he arranged to stop the Manchester train at Derby and transfer the passengers to the other London train. This conserved a considerable amount of engine power and was also of advantage in other directions an economy which it would have been difficult, if not impossible, to effect in the absence of adequate control facilities.

Pilot Arrangements.

All piloting work is fixed up by the control. Owing to the weights of the trains varying considerably, it was the practice to keep pilot engines standing at various places to meet any sudden demand for an assisting engine. This was not a very economical method of working, and under the new conditions, whereby the loads of the trains are all pre-determined and engine arrangements pre-arranged to suit the loading, standing pilots have been discontinued. As the controller has full knowledge as to the loading of all the scheduled trains, he is able to make the most efficient arrangements in order, as far as practicable, to obviate the use of pilots. Additionally, as he knows precisely where engines are available, or are likely to be available in the immediate future, as pilots on their homeward journey, the controller is able to utilise these engines—an arrangement not possible before information was centralised.

The close watch kept upon the working of pilot engines has resulted in a large reduction in the assisting mileage. In 1916 the total passenger train mileage was 17,954,450, of which the assisting mileage was 868,306, or 2·5 per cent., whereas this decreased the following year (when the passenger train mileage was 11,378,212) to 273,752, or 2·4 per cent.

ASSISTING MILEAGE.

	1916.	1917.	1918.	1919.	1920.
Total passenger train mileage	17,954,450	11,378,212	11,433,067	12,581,754	13,815,194
	868,306	273,752	349,752	315,799	270,021
Decrease compared with 1916	—	594,554	518,554	552,507	—
Percentage of assisting mileage	5	2.4	3	2.5*	2

* 48 weeks ending November 28, 1920.

In the table above I give some instructive figures to show the total of passenger train mileage, decrease in assisting mileage compared with 1916, and the percentage of assisting mileage to local passenger train mileage.

Records of Running Efficiency.

A study of the statistical records of passenger trains running is informative and shows how well the work has been performed. While it is, of course, impossible altogether to avoid delays, these are really of little consequence, and the percentage of punctuality is high.

Even in the early days of passenger train control the advantage of supervising the working was apparent, and on Monday, May 21, 1917, all the controlled expresses reached destination within five

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minutes of their scheduled arrival time. Out of 37 main line trains (19 down and 18 up), 35 arrived punctual, only two up trains being late—the actual delay in neither case being more than five minutes.

Information is summarised each morning on a card, which is submitted to the General Superintendent, and shows the passenger trains punctual and the number of those late in definite categories. For instance, the card for January 27, 1921, shows that 69 of the 88 main line expresses were punctual and that 15 others were less than five minutes late. The two down trains shown in the "11 to 20 minutes late" column were delayed owing to a derailment on the down main line at Derby North Junction, and the trains had to run over the goods line to St. Mary's. This explanation is entered on the back of the card in a space provided for remarks. A weekly summary card is also prepared for the information of the General Superintendent.

EXPRESSES.

P. S. F. 1019. O 25—1 side—7/18.

ARRIVALS AT DESTINATION.

Week ending JUNE 19th 1920

Service.	Day.	Arrivals at destination. Number of trains. Punctual.	1 to 5 mins. late.	6 to 10 mins. late.	11 to 20 mins. late.	21 to 30 mins. late.	31 and over mins. late	Total No. of Trains.
MAIN LINE. — DOWN	Mon.	41	11	·	1 *	·	·	53
	Tues.	46	4	3	·	·	·	53
	Wed.	42	8	3	·	·	·	53
	Thurs.	41	9	2	1	·	·	53
	Fri.	47	4	1	1	·	·	53
	Sat.	43	8	4	·	·	·	55
	Total	260	44	13	3 1*	·	·	320
UP.	Mon.	41	6	2	·	1†	·	50
	Tues.	45	5	·	·	·	·	51
	Wed.	41	10	·	·	·	·	51
	Thurs.	43	7	1	·	·	·	51
	Fri.	43	4	3	·	·	1†	51
	Sat.	41	10	2	1	·	·	54
	Total	254	43	8	1	1†	1†	308
WEST MAIN LINE. — DOWN.	Mon.	9	2	·	·	·	·	11
	Tues.	8	3	·	·	·	·	11
	Wed.	10	1	·	·	·	·	11
	Thurs.	6	4	1	·	·	·	11
	Fri.	8	1	2	·	·	·	11
	Sat.	7	1	2	1a	·	·	11
	Total	48	12	5	1a	·	·	66
UP.	Mon.	9	3	·	·	·	·	12
	Tues.	7	3	1	·	1b	·	12
	Wed.	3	2	1	1	·	·	12
	Thurs.	8	3	·	1	·	·	12
	Fri.	10	1	·	1	·	·	12
	Sat.	8	2	1	1	·	·	12
	Total	50	14	3	4	1b	·	72

* Mishap. † Loco. ‡ Air Raid. § Fog. ‖ Wind. ×Gale. a G.W. b N.E. c L. & Y. d L. & N.W. e G. & S.W. f N.B.

SUMMARY CARD, AS PREPARED WEEKLY FOR THE INFORMATION OF THE GENERAL SUPERINTENDENT, TO SHOW THE RUNNING EFFICIENCY OF EXPRESS TRAINS.

On the general question of efficiency in passenger train running special attention is directed to the following summary of

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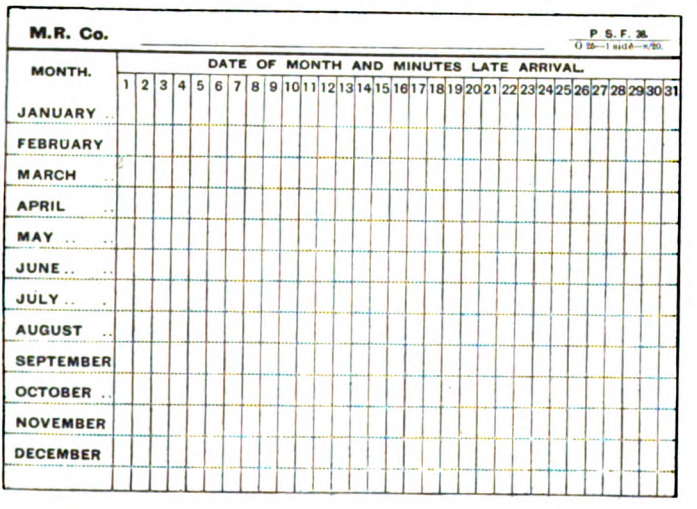
the results, which indicates steady and progressive development :—

Year.	Total number of trains.	Number of trains punctual or not more than 5 minutes late.		Number of trains over 5 minutes late.		Percentage punctual or not more than 5 minutes late.	
		Express.	Local.	Express.	Local.	Express.	Local.
1916	715,895	9,791	545,097	10,650	150,357	47·9	78·4
1917	407,868	11,728	337,986	3,660	54,494	77·0	86·0
1918	412,781	21,013	358,299	3,151	30,318	87·0	92·0
1919	441,365	29,967	411,398	4,148	39,731	86·0	90·0
1920	527,021	37,571	489,450	4,849	45,786	87·0	91·0

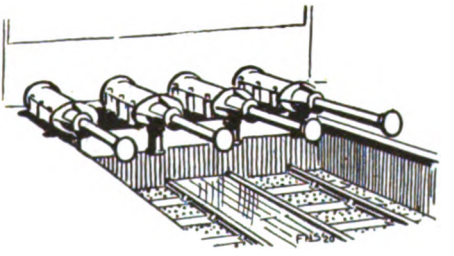
During 1917, ordinary passenger train mileage was reduced owing to war conditions by about 37 per cent. less than the service worked in 1916.

This shows that the express trains had a punctuality record (*i.e.*, less than five minutes late) of 47·9 in 1916, and that this had grown in 1920 to 87 per cent.—surely a magnificent achievement. Locals, on the other hand, in 1916 had a punctuality record of 78·4 per cent., this having grown in 1920 to 91 per cent.

Even with such a high percentage of punctuality there are naturally some trains that for one reason or another want careful watching and where the records disclose that a train is regularly five minutes or more late, the train is placed on the "black list," which provides a record of the running for a whole year. These cards are carefully watched and, if necessary, investigations are made with the object of bringing about an improvement. It rarely happens that trains are on the black list for very long, as it is usually practicable to make such arrangements as will raise them in the punctuality record.



THE "BLACK LIST" USED FOR THE DETAILED SUPERVISION OF ANY TRAIN REQUIRING WATCHING.



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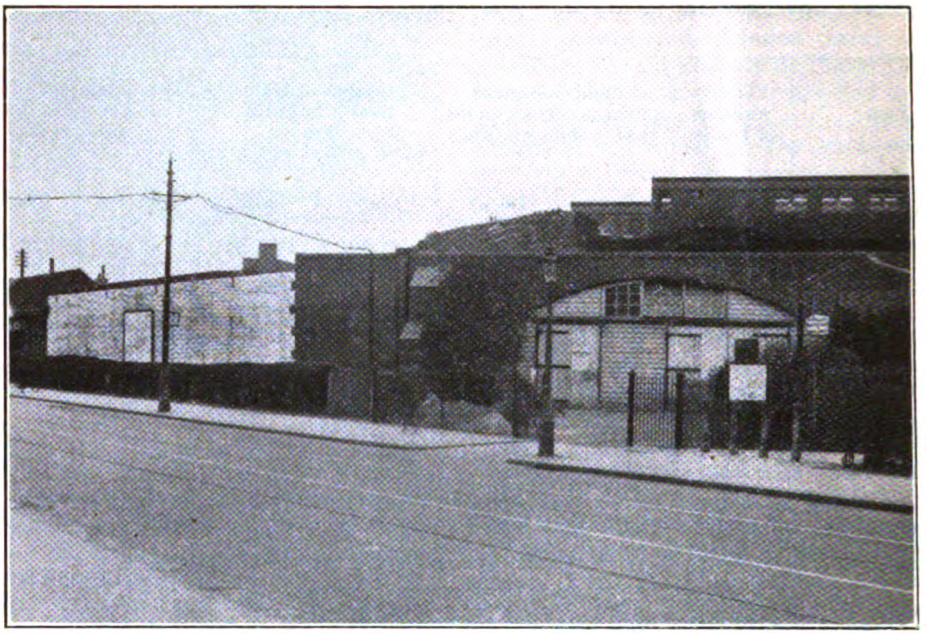

BRIDGE PARTLY ERECTED AT GOLDER'S GREEN, LONDON ELECTRIC RAILWAY, IN VIEW OF THE EDGWARE EXTENSION, YET TO BE MADE.

Railway Electrification Progress.

UNDER the Trade Facilities Act, designed by means of a system of State-assisted credits to enable works at present held up owing to the financial and industrial situation to be proceeded with, and thus to ameliorate in some degree the unemployment problem, railway electrification, in conjunction with much-needed improvements and new lines, has been brought strongly to the fore, and several companies have entered claims for assistance under this Act. There is, indeed, every justification for claiming that such works should be given prominence, if not precedence. All of them are urgently required if general public needs in regard to transportation are to be met, and most would have been already in progress, if not actually completed, had it not been for the war and the adverse conditions which it has created. For many, Parliamentary powers already exist, and plans, estimates, drawings and in some instances special equipment required, have been prepared, and in several cases a certain amount of work has been commenced. Such works have the further good point that they would absorb a considerable amount of relatively unskilled labour immediately they can be put in hand, while they would also entail the placing of contracts on a considerable scale with engineering firms within a wide range.

First to enter a claim for assistance were the "Underground" companies, several of whose undertakings have already entered the preliminary stages. The South Eastern & Chatham Railway issued particulars of their schemes, which will ultimately entail electrification of all lines within the wide range of their suburban routes; followed by the Great Eastern, where it has been recognised for some time past that electrification of all suburban lines must ultimately be carried out. In the case of the "Brighton" system, even before the war, work was already in hand for extending electrification to further sections of the suburban routes,

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and if this can be carried to fruition South London will be materially benefited. There is also the further scheme which will eventually bring Brighton, Eastbourne and Worthing within the range of electric services.

In view of the public interest which is thus being evidenced in the matter, and the fact that Government measures which will enable any or all of these works to be proceeded with will undoubtedly prove to be of advantage to the community to so marked a degree, the following brief summary of electrification works in regard to the leading home railways will no doubt be appreciated :—

Central London Railway.—Parliamentary powers obtained in 1920 for the construction of connections at Shepherd's Bush with the Hammersmith and Richmond line of the London & South Western Railway, to enable through services to be operated.

City & South London Railway.—Powers obtained, providing for the enlargement of the tunnels to accord with associated

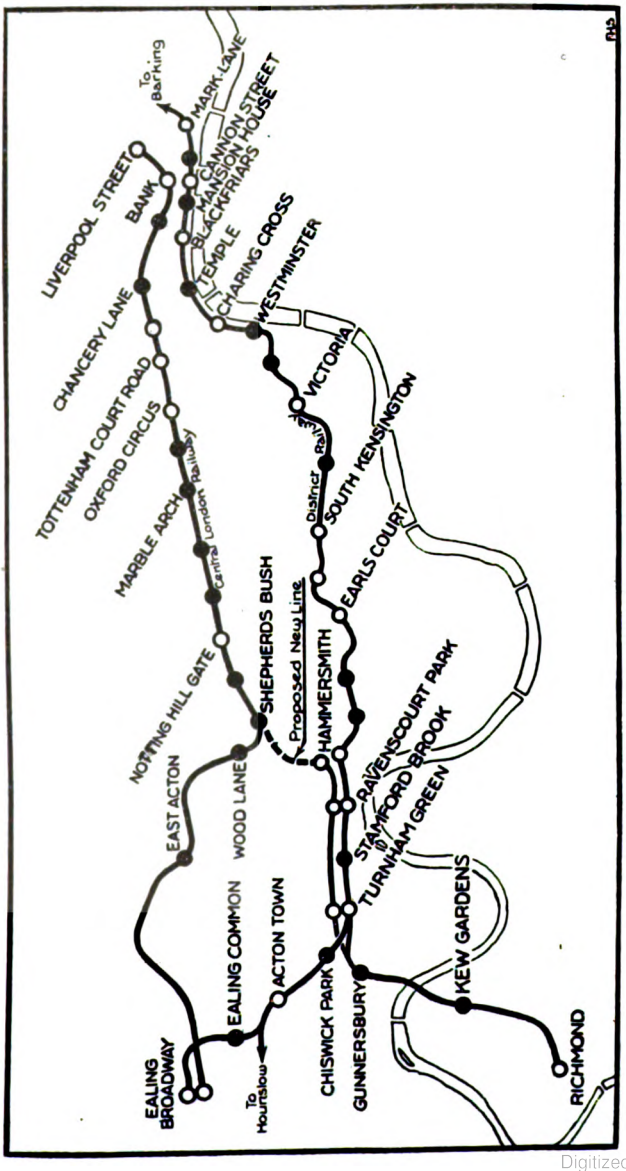

DIAGRAM SHOWING PROPOSED CONNECTION FROM THE CENTRAL LONDON RAILWAY AT SHEPHERD'S BUSH TO THE LONDON & SOUTH WESTERN RAILWAY AT HAMMERSMITH: ILLUSTRATING ALSO THE ALTERNATIVE ROUTES WHICH THIS CONNECTION WILL COMPLETE BETWEEN THE CITY AND HAMMERSMITH, KEW AND RICHMOND.

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tube railways and to make connections at Euston with the Hampstead section of the London Electric Railway. Plans prepared and special plant already available to commence the work of enlargement.

Great Eastern Railway.—Parliamentary powers were obtained in 1903, for it has long been realised that this company's suburban traffic must eventually be operated electrically, and general particulars of the proposed works were issued last year. Proposed routes are: from Liverpool Street to Enfield, Palace Gates, Chingford, Loughton, Epping and Ongar, and Woolwich, together with suburban sections of the main lines as far as Broxbourne and Gidea Park respectively.

London & North Western Railway.—Electric working was inaugurated between Willesden Junction and Earl's Court in May, 1914; from Broad Street to Richmond and Kew Bridge, October 1, 1916; the connection with the Bakerloo section of the London Electric Railway at Queen's Park was brought into use in May, 1915, and electric trains commenced to work through to Watford on April 16, 1917.

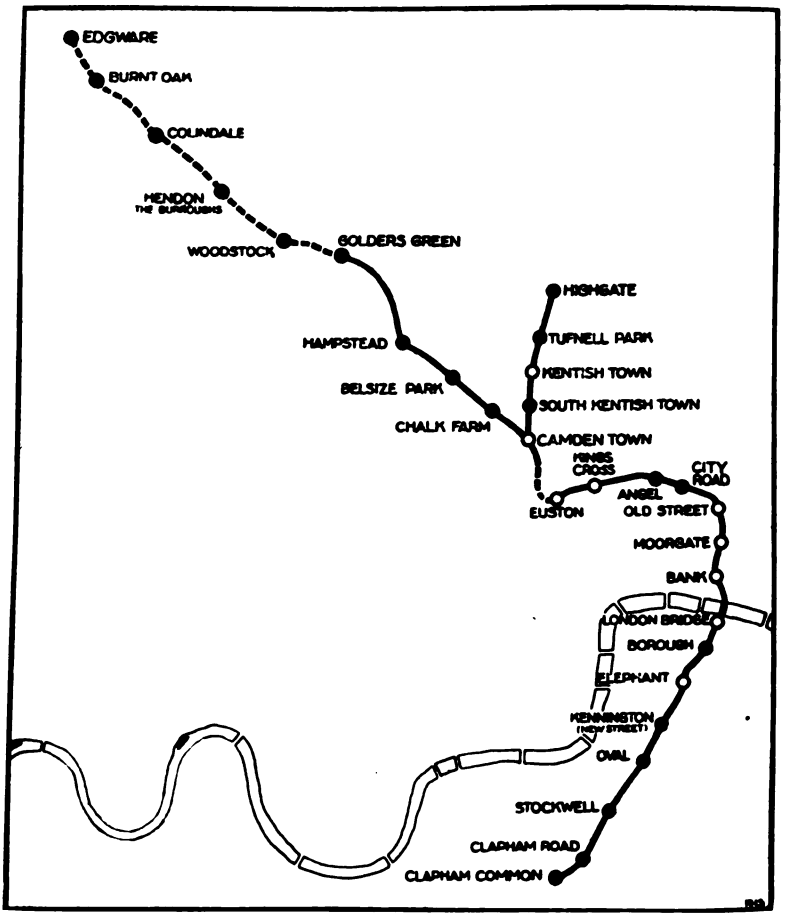

DIAGRAM SHOWING PROPOSED EXTENSION OF THE HAMPSTEAD SECTION OF THE LONDON ELECTRIC RAILWAY FROM GOLDERS GREEN TO EDGWARE; PROPOSED JUNCTION WITH THE CITY AND SOUTH LONDON RAILWAY; AND THE RESULTANT NEW THROUGH ROUTE FROM EDGWARE AND HIGHGATE TO THE CITY AND THE SOUTH OF LONDON.

New construction indicated by dotted lines.

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Electric trains are also operated between Broad Street and Watford via Hampstead Heath. Work is, however, still in progress on the routes from Euston, including the Chalk Farm alterations, and until that is completed the full value of electrification cannot be realised. Work is well in hand, but there will be a considerable demand for new rolling-stock. The entire scheme is covered by the Act of 1912.

London & South Western Railway.—The complete scheme outlined in 1912 provides for electrification not only of the Kingston "Roundabout" route, the Hounslow loop and the Shepperton and Hampton Court routes, but also of the main line as far as Woking, and thence to Guildford, and the two routes via Oxshott and via Epsom to Effingham Junction and thence to Guildford. Electrification work so far completed and the dates of inauguration of electric working are:—Waterloo to Wimbledon via East Putney, October 25, 1915; Kingston "Roundabout" and Shepperton lines, January 30, 1916; Hounslow loop line, March 12, 1916; Hampton Court line, June 18, 1916; and from Hampton Court Junction to Claygate, November 20, 1916. Conspicuous success has attended electrification so far carried out, except that the Claygate service has been temporarily discontinued until further sections of the complete proposals can be taken in hand. The remainder of the scheme is, however, at present in abeyance, though it could be proceeded with at short notice were the financial difficulties overcome.

London, Brighton & South Coast Railway.—The company's Act of 1903 covers the working of the entire system electrically, if desired. Electric traction on the high-tension single-phase system, with overhead conductors, was inaugurated December 1, 1909, on the South London line; between Victoria and Crystal Palace, May, 1911; and Peckham Rye and Tulse Hill, June, 1912. The immediate scheme provides, however, for electrification of practically all suburban lines and many sections, notably the main line from Balham to Norwood Junction, via Selhurst, and connections from the Crystal Palace to Norwood Junction, together with the connections from Selhurst and Norwood Junction to West Croydon, have already been equipped with supports for the overhead conductors, and the electrical equipment supplied to some extent. Little has been done, however, as yet on the New Cross–Norwood Junction section, thence to Coulsdon, or on the routes from Tulse Hill, Balham and West Croydon to Sutton and Cheam. Full Parliamentary powers have been secured for this work, but the demand for electrical plant and new rolling-stock has prevented further progress being made. The greater scheme which will provide for electrification of the main line to Brighton, and eventually of most other main routes, will follow when the suburban system has been dealt with.

London Electric Railway.—Work on the extension of the Hampstead section of the London Electric Railway from Golders Green to Edgware as a surface line has been prepared by the purchase of land, &c., and further work could be started almost immediately.

Metropolitan District Railway.—The Wimbledon & Sutton Railway, incorporated 1910, is to be worked in conjunction with the Metropolitan District, London & South Western, and London, Brighton & South Coast Railways. Preparatory work has been undertaken, but hitherto it has not been possible to proceed further with this line, which will open up important residential districts.

Metropolitan Railway.—In 1912 and 1913, Acts were obtained providing for extension of electrification to Rickmansworth and for a new line to Watford, and it is proposed to proceed with this.

Midland Railway.—In 1912, in connection with the acquisition of the London, Tilbury & Southend Railway, powers were obtained for the electrification of the London, Tilbury & Southend line to Upminster, and eventually to Tilbury and Southend; also for widening works and new lines in conjunction with the Great Eastern Railway between Stepney and Gas Factory Junction. This work is urgently demanded, but so far it has not been possible to put it in hand.

North Eastern Railway.—Particulars have been announced, for the ultimate electrification of the main line between York and Newcastle, and of associated sections.

South Eastern & Chatham Railway.—Parliamentary powers were obtained in

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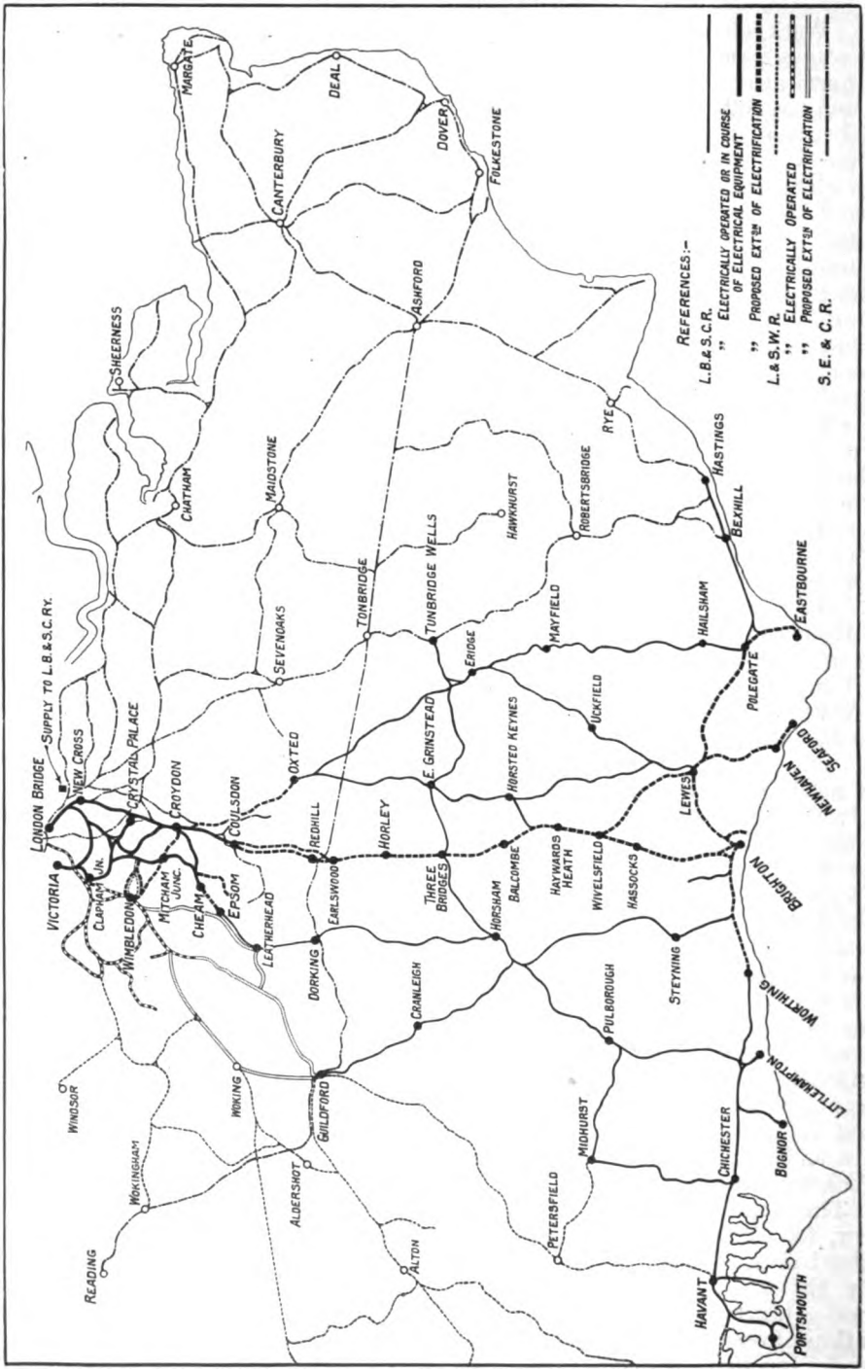

MAP OF L.B. & S.C.R. AND ADJOINING LINES, SHOWING ELECTRIFICATION PROPOSALS OF THE BRIGHTON COMPANY.

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1903, and although no work has actually been commenced there is urgent need for electrification of suburban lines. The scheme now proposed provides for electrification of the various routes to Dartford, the main routes to Bickley and Orpington and to Bromley North, the Crystal Palace and Catford lines, and the Mid-Kent line, with associated sections. Eventually, it is proposed to extend electrical working to Strood, Gillingham, Sevenoaks, Tonbridge, Oxted, and via Croydon, to Redhill, Dorking and Tonbridge, together with the busier branches.

In regard to several of these undertakings further particulars of interest may now be given :—

Extension of the " Hampstead " section of the London Electric Railway from Golders Green to Edgware, with four intermediate stations, will open up a residential district at present not too well supplied with railway facilities. Work on certain bridges has already been started, and land has been purchased and partially cleared.

Reconstruction of the City & South London Railway, to bring this line up to the present-day standards, will increase its carrying capacity by over 100 per cent. In addition to this reconstruction, it is proposed to make a junction with the Hampstead and Highgate lines of the Underground system at Camden Town, to enable through trains to be run eventually between Clapham Common in the south and Highgate, Golders Green and Edgware on the north. Incidentally, the fulfilment of this scheme will provide a through route to Moorgate, the Bank and London Bridge for residents in north-west London, thus saving many minutes in the daily journey times to and from the City.

The construction of a loop line at Shepherd's Bush, to link up the Central London Railway with the derelict section of the London & South Western Railway at that point, and the electrification of this small section of line, will enable through trains to be run from Liverpool Street and the Bank via the Central London Railway to Hammersmith and so on to Kew and Richmond. The carrying out of this scheme will be the means of giving considerable relief to the District Railway, as it will provide an alternative route to the City from Kew and Richmond.

The London, Brighton & South Coast was the first of the great lines to electrify railways hitherto steam-operated on an extensive basis within the London area, and in view of the fact that it employs a system which so far has not been adopted by any other railway in the United Kingdom, it affords a striking example of what can be done. The Brighton suburban system is, indeed, eminently suitable for such an experiment, owing to the multiplicity of routes to be served and the heavy traffic within a dozen miles of the termini, while the ultimate object of electrifying throughout to Brighton renders the entire project one of exceptional interest and importance.

On the advice of Sir Philip Dawson, the high-tension single-phase system, with overhead conductors, was selected, traffic being inaugurated on December 1, 1909, on the South London section, other routes following from Victoria to the Crystal Palace, via Balham and West Norwood, in May, 1911, and from Peckham Rye to West Norwood in June, 1912, thus permitting of through electric trains being run from both Victoria and London Bridge, via Streatham Hill and Tulse Hill respectively, to the Crystal Palace, together with trains from London Bridge to Clapham Junction or Victoria via Tulse Hill and the spur thence to Streatham Hill, in addition, of course, to the South London services.

Conspicuous success has followed these original installations, and in 1914 active steps had already been taken for equipping a considerable further mileage of suburban lines. As regards the London suburban area, work had already been commenced and contracts let before the outbreak of war in 1914, and has to some extent been proceeded with since, supporting structures for the overhead conductors, and in some instances the conductors themselves and associated plant, having been erected along several miles of track, where, however, electric traction is not yet systematically installed. The lines thus required to complete the essential routes of the London suburban system are the Victoria main line from Balham to Selhurst ; the London Bridge main line through New Cross to Norwood Junction ; the routes

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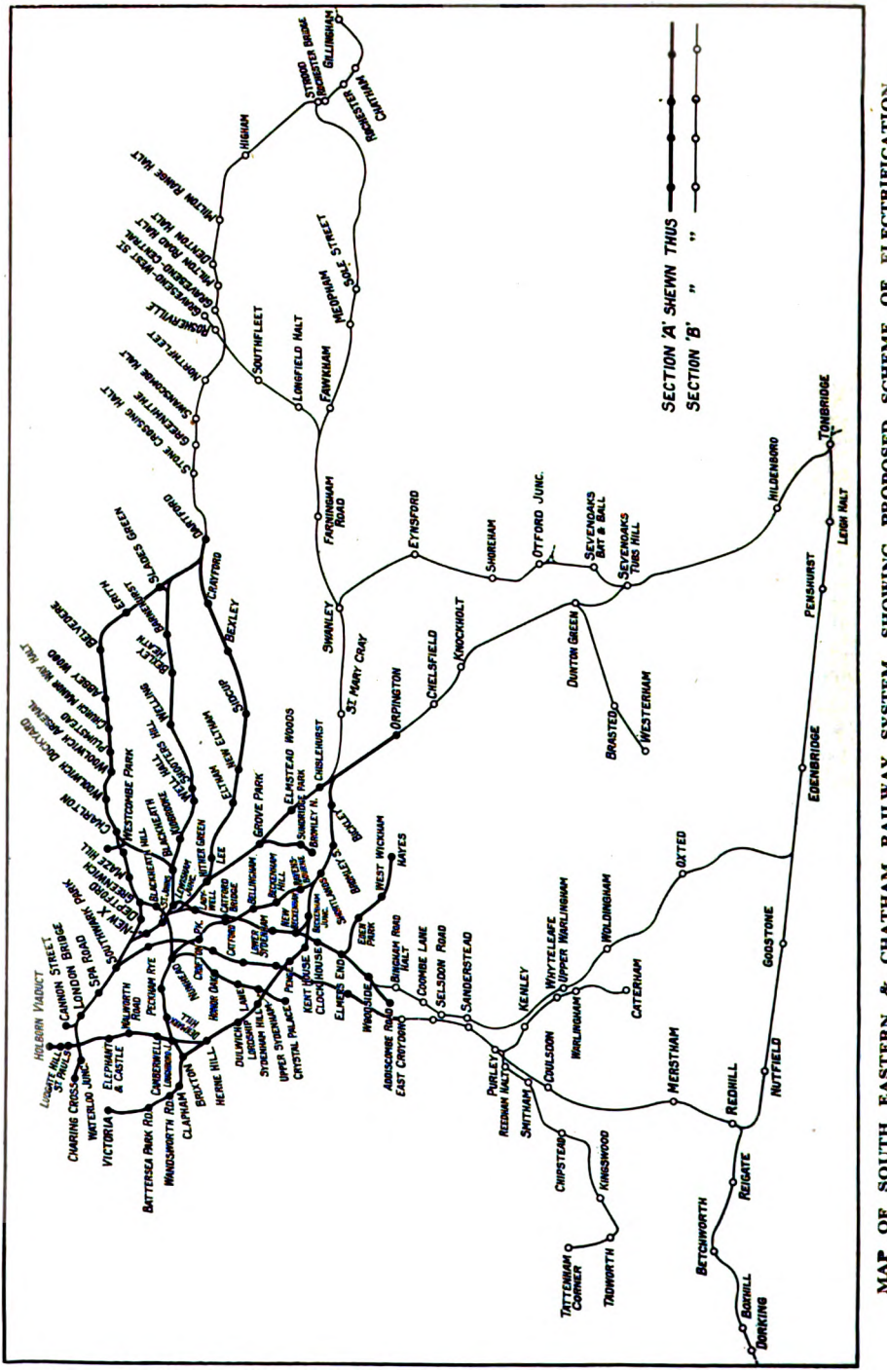

MAP OF SOUTH EASTERN & CHATHAM RAILWAY SYSTEM, SHOWING PROPOSED SCHEME OF ELECTRIFICATION.

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thence to East Croydon and Coulsdon ; to West Croydon, Sutton and Cheam, and the direct lines from Tulse Hill to Mitcham Junction and via Carshalton to join the Sutton line. As already indicated, work commenced before the war, and that which it has been possible to continue during the last two years has enabled part of the track equipment on several of these routes to be partially completed. In fact, it is possible to run electric trains from the Crystal Palace to Norwood Junction, and so to the car sheds, though this route is not yet systematically operated electrically. It is hoped to inaugurate electric working from Balham to West Croydon, via Norbury, Thornton Heath and Selhurst, during next year, the delay being due mainly to the difficulties of obtaining electrical equipment at reasonable cost and the need for considerable additions to the electric rolling-stock.

The plan reproduced shows, however, that the Brighton Company is now seriously considering the main line electrification to Brighton, which has been in view since 1910. This route provides ideal conditions for main line electrification, seeing that it already carries a very heavy traffic from end to end and intermediately, the train services as a whole being of a notable and exceptional character, but which urgently call for amplification to meet the needs of this ever-growing and very popular traffic. With the main line, which will include both routes between Coulsdon and Earlswood, will be associated the Brighton local lines, westward as far as Worthing, and eastward to Lewes, Polegate and Eastbourne, together with the direct line from Lewes to the Newhaven and Seaford branch. It is also proposed to extend electrification to the Croydon and Oxted section, and from Cheam to Epsom, while the London suburban system is to be completed by the Wimbledon loop, and the cross lines from Wimbledon to Mitcham Junction and West Croydon.

It will therefore be seen that the Brighton Company, providing the necessary material can be obtained and the financial aspects satisfactorily settled, is already in a position to extend electrical working to the principal suburban routes within a short period, much of the preparatory work, in fact, being already done, while the larger scheme, which will certainly have to be carried out in due course, is of a pressing character, and one which, when it is realised, will prove of great value to a large section of the travelling public. Eastbourne and Worthing, together with Brighton, provide, indeed, a very large volume of regular and residential traffic which calls for even more fast business trains than are at present supplied, and by electric working it should be possible to provide these and other important stations with facilities commensurate with the importance of the traffic. A solution would also be provided for the problem of dealing with the very heavy pressure upon these train services during holiday periods and week-ends. Whether regarded from the suburban or from the main-line point of view, therefore, the Brighton Company's electrification scheme has necessarily figured very prominently for several years in the plans of the directors, and of Sir William Forbes and his chief officials.

In regard to the South Eastern & Chatham Railway, the area to be served is so large, and the cost of conversion will involve heavy capital expenditure, that it is proposed to divide it into two sections, so as to provide for the work being carried out by stages. The sections into which the proposed scheme is divided represent the inner and outer suburban areas respectively, and are clearly shown in the accompanying map, and include the following lines :—

Section A—
- North Kent and Greenwich lines.
- Bexley Heath line.
- Dartford loop line.
- Main line to Orpington and the Bromley North branch.
- Mid-Kent and the Hayes branch.
- Main line to Bickley and Orpington.
- Crystal Palace and the Greenwich Park branches.
- Catford loop line.

Section B—
- Dartford to Strood.
- Bickley Junction to Gillingham.
- Swanley to Sevenoaks.
- Orpington to Tonbridge and the Westerham branch.
- Croydon to Redhill and Dorking.
- Caterham and Tadworth branches.
- Oxted line.
- Redhill and Tonbridge line.

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The single-line mileage, including sidings, covered by section A will be 210 (94 route miles), and that covered by section B 438, making a total single line mileage of 648 (140 route miles).

It is proposed to carry out the work in three stages, and at the completion of each stage the following classes of traffic will be worked electrically :—

Stage 1—

Suburban services to stations within section A.

Stage 2—

Suburban services to stations within sections A and B.

Stage 3—

Suburban services to stations within sections A and B.

Through passenger traffic within sections A and B.

Goods traffic within sections A and B.

In all cases suburban services will be worked by motor car trains, while through passenger and goods trains will be hauled by electric locomotives. It is estimated that there will be a 30 per cent. average increase in speed and frequency of service to stations within section A, whilst to stations in section B the average increase in speed will be 40 per cent. and in frequency of service 60 per cent. The technical features of the scheme are the result of a thorough investigation by the engineers, and are, in their opinion, most suitable for the South Eastern and Chatham system. In due course both suburban and main line traffic will be electrically worked, and the scheme proposed may be conveniently and economically extended to cover the operation of the whole railway and the Channel Tunnel, if constructed.

The generating station will have a very high load factor, and will be of a size sufficient to justify units of a large capacity being installed, with consequent high efficiency and economy in operation. High tension alternating current will be transmitted to the sub-stations, where, after being transformed and converted to direct current, it will be fed to the conductor rail. The track equipment will consist of conductor rails supplying energy to the train motors at 1,500 volts direct current, suitable protection being provided against the risk of accidental contact.

Rolling-stock for the suburban services will consist of compartment-type coaches controlled on the multiple-unit principle, arranged and permanently coupled as three-coach units, each unit consisting of two third-class motor coaches, each equipped with two 200-h.p. motors, and one first-class trailer coach, thus providing for the operation of trains made up of three, six or nine coaches, seating 256, 512 and 768 passengers respectively, according to traffic requirements.

But for financial and industrial conditions a start would probably have been made with the work some time ago, and if these difficulties are now surmounted, it is anticipated that the first stage of the electrification will be completed within a period of three years from a commencement being made.

Notwithstanding the remarkable results achieved in regard to increasing train facilities on some of the busiest suburban routes, the Great Eastern Railway must eventually electrify the whole of its London suburban lines if its traffic problem—perhaps one of the most difficult in the London area—is to be finally solved. The matter has, indeed, been under close consideration for some considerable time, and more than a year ago particulars were made public as to the general intentions of the company in this respect.

The routes mainly concerned are those from Liverpool Street to Enfield, with the Palace Gates branch; to Chingford; the Epping and Ongar line, at least as far as Loughton and the Fairlop line; the Woolwich branch and the associated Royal Albert Docks line; the Cambridge main line as far as Broxbourne, and the Colchester main line at least as far as Gidea Park if not to Brentwood. It will probably be necessary also to equip the route from Fenchurch Street to Stratford, and one route through Stratford (Low Level) station and Lea Bridge and South Tottenham, to link up the Woolwich and Palace Gates lines. All these routes in so far as they radiate from Liverpool Street, carry traffic in exceptional volume, and notwithstanding the special measures adopted for the Enfield and Chingford services and the preparations made for adopting similar methods in regard to the Loughton and Ilford routes, only by

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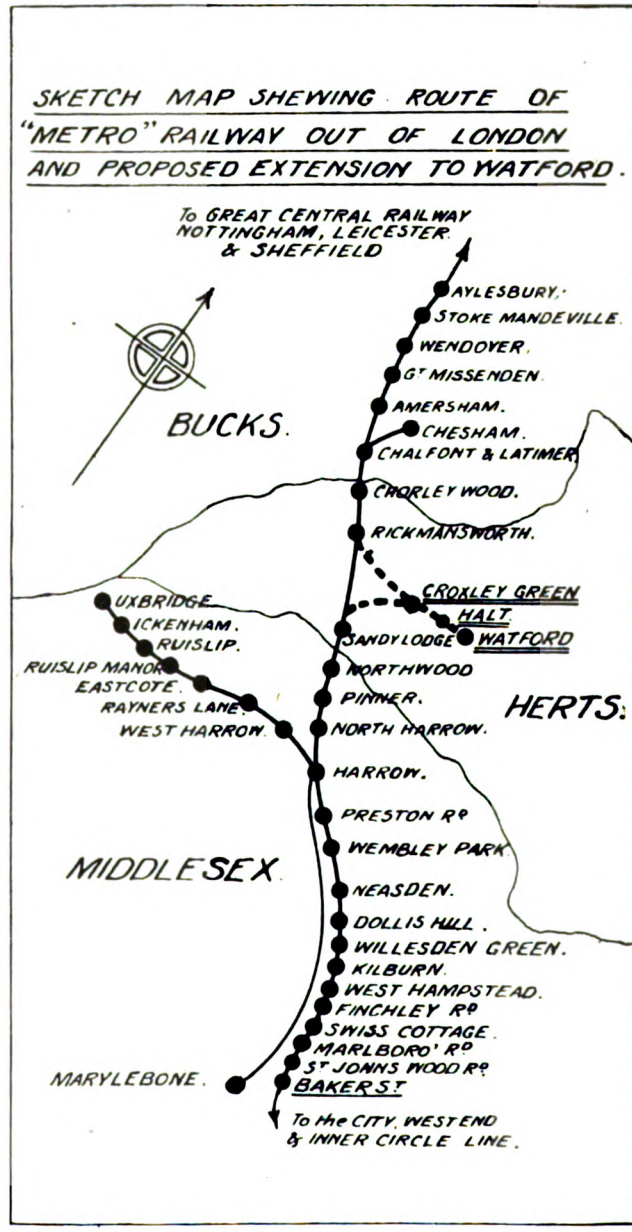
electrification can facilities on these routes be fully developed and the needs of the future adequately met.

Traffic will probably be operated on the multiple-unit principle, existing bogie vehicles being adapted to run as trailers, others being equipped to form motor and control cars. It may be necessary to make certain track alterations at Stratford, but otherwise, Great Eastern Railway suburban traffic is already sectionalised to a considerable degree, so that the possibilities of rapid acceleration associated with electric traction should make it possible to increase very materially the traffic capacity of lines, although they are already very severely taxed during the busy periods. This will follow, especially if automatic signalling is installed, as will no doubt be the case.

In regard to the Liverpool Street–Broxbourne route this is not quite so heavily taxed on the passenger side as others, and, therefore, offers a valuable field for development. The Woolwich branch has a very heavy passenger traffic between Stratford Market and Woolwich, and this would be materially relieved by electric traction, though it would not be necessary to run more than a proportion of the trains through to Liverpool Street or Fenchurch Street. The Woodford and Fairlop line could also be considerably developed were the increased facilities practicable under electric traction given.



SKETCH-MAP SHOWING METROPOLITAN AND GREAT CENTRAL LINES, AND JOINT LINE, WITH PROPOSED EXTENSION TO WATFORD.

As showing the severity of the problem with which the Great Eastern Railway has to deal, it may be mentioned that at busy periods the Enfield, Palace Gates and Chingford routes are together provided with 24 trains per hour, the Loughton and Ongar route with 9-12, and the Ilford route with about the same number, all being made up of full length suburban coaches providing seats for about 850 passengers, the loads being frequently increased by several hundreds of people

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standing. On the Woolwich line, too, there are at times from 8 to 10 trains per hour in each direction.

Another important scheme designed to improve London's transport facilities, provide considerable employment and, likewise, give London "additional elbow-room," is that put forward by the Metropolitan Railway.

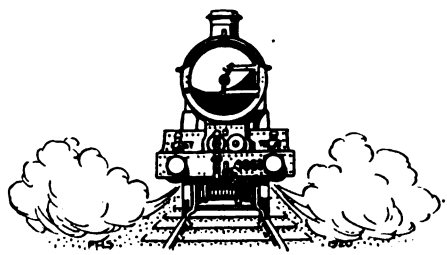
For years past the Metropolitan Railway has been repeatedly petitioned by local councils, tradesmen's associations and inhabitants alike to provide Watford, the largest and most important town in Hertfordshire, with a "Metro" train service to London and an alternative through and rapid route to a large number of important places in the north. Whilst they have been eager to meet the proven demand, the war and stringency of money has hitherto precluded the Metropolitan Company from embarking on the scheme. The Trades Facilities Act, however, should provide the means, seeing that Parliamentary powers have been already secured and the necessary land purchased, jointly by the Metropolitan and Great Central Companies, and the way is thus cleared for an immediate start.

The extension will cost approximately £300,000, and extend a distance of three miles. It will branch off from the main line at a point between Sandy Lodge and Rickmansworth, and afford, by means of a triangular junction, direct means of communication to and from Baker Street, Marylebone, Euston Square, King's Cross and the City, including Aldersgate, Moorgate, Liverpool Street and Aldgate. In fact, it will enable a passenger to entrain at Watford and be carried without a change of carriage to all the City stations. In the reverse direction the extension will render easy of access, over the lines of the Great Central Company, towns like Leicester, Nottingham, Sheffield, Bradford, Leeds, York, Hull and Halifax, together with the coal-producing and manufacturing centres of the north generally.

Three new stations will be provided for—Croxley Green, serving the growing district of that name and the valley of the Gade respectively; Watford Golf Links Halt, conveniently situated at the edge of the West Herts Golf Links, and Watford, situated at the south west side of the town adjoining the Grammar School at a point where housing development is especially active. The construction of the line will entail the building of a number of bridges, a considerable amount of embankment work, the erection of electric sub-stations and the laying of cables, conductor rails, &c.

The "Metro" and Great Central Companies at the present time provide over 250 trains per day between Harrow and London, and as many of these trains as are necessary could readily be run to and from Watford, not merely to meet the immediate demand, but also on a developmental basis.

It is proposed to operate the new line at first by steam traction, but so soon as the traffic assumes expected density the electric system from Harrow will be pushed forward to Watford, and power-producing plant to cover this extension is now actually being installed at the "Metro" power station at Neasden, while the necessary electrical equipment for track is being provided for.



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London and North Western Railway War Memorial.

IMPRESSIVE UNVEILING CEREMONY AT EUSTON.

WHATEVER the London and North Western Railway undertakes in times of national rejoicing or sorrowing, is always done well, and the recent ceremony in connection with the unveiling of the dignified and appropriate war memorial in the main approach to Euston Station, was no exception to the rule. Field-Marshal Earl Haig unveiled the monument, the Archbishop of Canterbury dedicated it, and the Chairman of the London and North Western Railway (the Hon. Charles Napier Lawrence), who gave the opening address, was supported by the following directors :

Sir Edward Tootal Broadhurst, Bart., Mr. Ralph Brocklebank, Mr. Charles James Cropper, Mr. W. E. Dorrington, Viscount Elveden, the Hon. A. H. Holland-Hibbert, Mr. W. L. Hichens, Mr. J. Bruce Ismay, Lord Kenyon, Lord Lambourne, the Hon. Sir Arthur Lawley, G.C.S.I. Mr. G. Macpherson, Sir Robert Turnbull, Sir Thomas Williams. There were also present the General Manager (Mr. Arthur Watson, C.B.E.), the Chief Engineer (Mr. E. F. C. Trench, C.B.E.), the Chief Mechanical Engineer (Mr. H. P. M. Beames), the Chief Locomotive Running Superintendent, (Mr. F. W. Dingley), and the Superintendent of the Line (Mr. L. W. Horne, M.V.O., C.B.E.), together with all the principal officers of the company.

No fewer than 3,719 employees of the London and North Western Railway gave their lives in the war, and the memorial in their honour is an obelisk 45 ft. in height intentionally devoid of ornament, and surmounted on each side, as the crowning feature of the design, with a cross. At the base four bronze figures, representing the Navy, the Infantry, the Artillery and the Flying Corps, typify the comrades of the fallen, and form a perpetual guard of honour with bowed heads and reversed arms. On the southern face of the obelisk is inscribed in large Latin lettering, " In Memory of Our Glorious Dead." The lower portion of the monument consists of a pedestal with a tablet of granite bearing the inscription :—

" In grateful memory of 3,719 men of the London and North Western Railway Company who, for their Country, Justice and Freedom, served and died in the Great War, 1914-1919. This monument was raised by their comrades and the company as a lasting memorial to their devotion."

The monument was designed by Mr. R. Wynn Owen, A.R.I.B.A. To the nearest relative of each of their fallen employees the North Western Company have presented a copy of a beautifully designed album, in colours, containing a representation of the war memorial, the company's Roll of Honour, and a complete record of the war honours won and the war work done by those who stayed at home. The album was originated by Mr. F. Hare, of the General Manager's Department, Euston, and he also supplied the design for some of the pages.

31,742, or 34 per cent., of the total staff joined the forces, and the number who lost their lives represents 11·7 per cent. of those who joined ; 950 secured naval or military honours, and three members of the staff gained the V.C.—Lance-Corporal J. A. Christie, Private E. Sykes and Private W. Wood.

Special trains from all parts of the system brought employees and relatives of the fallen to the number of over 8,000 as guests of the company to Euston for the ceremony. A place of honour close to the memorial was given to Mr. E. Sykes, V.C., who held a great wreath of laurel which was placed, on behalf of the company, at the foot of the memorial, together with several other beautiful floral tributes. A contingent of the London and North Western employees of all grades, most of whom wore many war decorations, were drawn up in the form of a square around the memorial.

The choir consisted of London and North Western Railway employees from various parts of the system, and the Crewe Works Military Brass Band provided the instrumental music. When

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Earl Haig unveiled the memorial four buglers of the Scots Guards sounded the "Last Post," and the Chairman of the company placed a laurel wreath of "Remembrance" on the memorial on behalf of the directors.

Earl Haig, addressing the assembly, expressed the thanks of the old army he commanded to the railways of the country,

[*R. Wynn Owen, A.R.I.B.A., Architect.*

THE ARCHITECT'S DESIGN.

and not the least among them the London and North Western, for their splendid conduct and loyal support throughout the great struggle. It was scarcely an exaggeration to say that without adequate railways to serve it the modern army could neither move, feed, nor fight. We needed a vast network of railways of broad and narrow gauge behind our front in France, not to mention light tramways. That wonderful network of lines we had to construct ourselves, and for every offensive we had to build scores of hundreds of miles of new lines. Before the end of the war the whole area behind our front line was so linked up with railways that a big offensive might have been mounted without much further construction at almost any point, and this had been accomplished in the midst of the dangers and vicissitudes of unrelenting war. There was little of the heady excitement of battle about that work but it was patient, steady, courageous labour under shell fire.

Those were the conditions under which so many British railwaymen in France lived, worked and died. In 1918 alone

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we built or reconstructed in France 2,340 miles of broad-gauge track and 1,348 miles of narrow-gauge railway. In six months of that year the average weekly load carried by our railway system out there amounted to 530,000 tons each week, employing 1,200 locomotives and 52,600 trucks. Considering broad-gauge alone, the result of our work in France in 1918 was about equal to the whole existing system of the Great Central Railway, bigger than the London and South Western or the Lancashire and Yorkshire, and nearly twice as big as the London, Brighton and South Coast. The feat could not have been accomplished but for the loyalty and unselfishness and efficiency of the railways at home. English railways tore up their lines to give them railways in France and cut down their services to a minimum to supply the army with wagons and materials in the fighting zone. The railways sent them skilled men, rolling-stock and materials of all kinds, and yet carried on still at home.

None of the railways had a finer record than the North Western, and he imagined the figure of over 31,000 sent to the Colours was unsurpassed. He congratulated the management on the generous way in which they had treated their men while serving with the Colours and after their return, and on the manner in which they had recognised the claims of the widows and dependents of the fallen. They had set a fine example in that matter to all employers.

"I have a special debt of my own, moreover, to acknowledge and thank you for," continued the gallant Field-Marshal, "It was a London and North Western train, engine and staff which carried me about in France during the critical days of 1918, which formed my advance headquarters and finally steamed to Metz, Strasburg and Cologne. Your Chairman, too, is the brother of General Lawrence, who was my chief of staff during those 1918 days. The work of the British railways during the Great War was a great and noteworthy achievement, and not the army only but the whole nation owes you thanks for it. It could scarcely have been done had not the same spirit of loyalty and patriotism inspired as a whole all grades of railwaymen. It remains for us who are left behind to remember that on us now rests the burden those men bore so bravely."

The ceremony, which will live long in the memories of all those who were privileged to be present, concluded with the National Anthem.

JANUARY, 1922, RAILWAY MAGAZINE

will commence the 50th Volume

and also be a

SPECIAL SCOTTISH NUMBER.

LOCOMOTIVE AND TRAIN WORKING IN THE LATTER PART OF THE 19th CENTURY. The first instalment of Mr. E. L. Ahrons' article on the Great North of Scotland Railway will appear in that issue.

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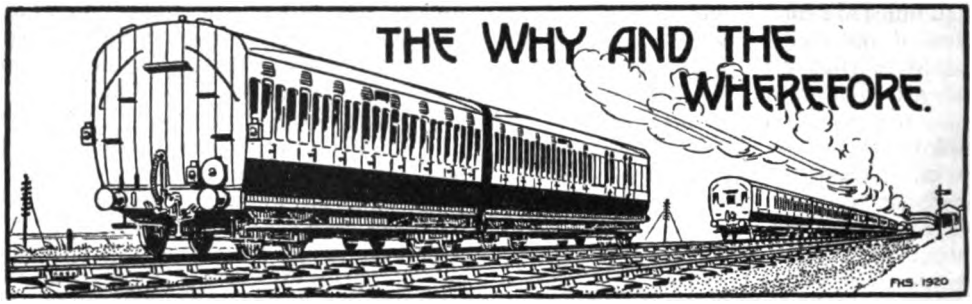

RAILWAY MAGAZINE *readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to locomotive sheds and to the dimensions of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. Queries respecting British Locomotive Practice and Performance should be sent to Mr. Cecil J. Allen, c/o* RAILWAY MAGAZINE, 30, *Fetter Lane, Fleet Street, London, E.C.4. Queries should not be of purely local interest. No reader should forward more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history and the like, readers should consult the pages of the "Railway Year Book." The twenty-fourth Annual Edition of this standard railway reference work is now on sale, 5s. net, or by post from the* RAILWAY MAGAZINE *Offices, 5s. 9d.*

Great Chesterford and Newmarket Railway.

This line, about 18 miles long, was opened between Great Chesterford and Six Mile Bottom for traffic on April 4, 1848, and on October 10, 1851, was incorporated with a branch line, opened October 9, 1851, about six miles long from Cambridge to a point about 70 chains west of Six Mile Bottom station. The former portion was closed about 1853. The remainder was purchased by the Northern and Eastern Railway Company for £329,923 in 1854. These branches were all single lines, and as far as can be ascertained the only station between Great Chesterford and Six Mile Bottom was at Abington (near the present station at Pampisford), although there may have been halting places on the route. It is stated that in the event of this branch ever being closed for traffic the land acquired for its construction was to revert to the original owners. The Great Eastern Company is responsible for the two underline bridges (Hills Road and near Wilbraham), as well as for the roads they carry. The present hotel at Pampisford incorporates the old station buildings.

[Reply to "ANGLO-SCOT."]

Talla Branch Railway.

We are indebted to Mr. R. Killin, C.B.E., Superintendent of the Line, Caledonian Railway, for particulars of this line, observed during a journey from Peebles to Moffat. This line, known as the Talla Branch, was constructed in 1895 as a service railway to carry the materials necessary for the making of the Edinburgh and District Water Trustees Reservoir at Talla, about a mile east of Tweedsmuir church. It connected with the Caledonian Railway Peebles branch at Broughton station, and was laid for 1 mile and 8 chains on the company's property, the lines running alongside those of the Peebles branch for that distance out of Broughton station. The line was operated by the reservoir contractors, and was not used after the completion of the reservoir in 1907. The total length of the railway was 9 miles 41 chains, and the rails were removed at various periods between 1911 and 1918.

[Reply to G. R. TRAVIS-CLEGG.]

Locomotive Dimensions and Tractive Effort.

Questions concerning the dimensions and tractive effort of individual locomotives are excluded by the rules, and although we have answered them on several occasions as an "act of grace," we can no longer continue to do so. For the last time we give the tractive force formula :—Tractive effort $= \frac{d \times s \times p}{D}$

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where d = cylinder diameter, s = stroke, p = mean effective pressure (generally taken at 80 per cent. working pressure), and D = diameter of driving wheels. This is for a two-cylinder simple engine; for a three-cylinder simple multiply the result by 1·5, and for a four-cylinder by two. The above remarks apply also to comparisons in power between different locomotive types. For dimensions of rebuilt Lancashire and Yorkshire 4-6-0 engines see May issue.

[Reply to F. P. MILLARD, P. H. LEE and others.]

Furzebrooke Siding, London and South Western Railway.

We are informed by the London and South Western Railway that at this siding, between Worgret Junction and Corfe Castle, the points leading to and from this siding are operated from a ground frame and controlled by the tablet for the Worgret Junction and Corfe Castle section in accordance with the regulation for controlling sidings by means of the electric train tablet. Tyers' No. 7 tablet instruments are installed in connection with this siding, and when it is necessary for a train to be shunted clear of the running line in order that other trains may pass through the section the instructions contained in Regulation 34a of the Electric Train Tablet Regulations must be complied with.

[Reply to A. J. H.]

South Eastern and Chatham Railway Locomotives.

"Southern" points out that besides Nos. 440-449 of Mr. James Stirling's last 4-4-0 class, a few others were built to the same design in 1898–1900, including Nos. 13, 17, 21, 34, 101, 132, 186, 189 and 217, all replacing old Cudworth 2-4-0 engines. He also mentions that for a time Nos. 454 and 459 were adapted to burn oil on the Holden system. Most have been rebuilt, as already stated, but one or two, together with some of the remaining 4-4-0's of earlier classes, still have domeless boilers. Among them are Nos. 13, 441 and 458 (larger class), and 22, 45, 139, 194, 210 and 222 of the 240 class. Mr. W. J. Reynolds also writes in regard to these engines.

[Further reply to L. G. PEGRAM.]

"Single" Locomotives, Midland Railway.

Mr. R. H. Coe mentions that No. 614 has been piloting heavy expresses between Bristol and Derby during the past summer; Nos. 661, 662 and 670 are still engaged on local services between Gloucester and Bristol, and frequently act as station pilots at these places; Nos. 665 and 679 are apparently "derelict" at Bristol and Bromsgrove, respectively; Nos. 612 and 614 were frequently to be seen in St. Pancras during last July and August; No. 666 was also often to be seen on the main line. As far as he knows most of the others are out of traffic and will probably be scrapped in due course.

[Further reply to A. H. HARRISON.]

Hull and Barnsley Locomotives.

We are informed by Mr. M. Stirling that the following locomotives in use on this line have steam domes: Nos. 1-12, 0-6-0 tank engines of class "G.1," built by Beyer, Peacock & Co. in 1885, and which retain the original boilers, and Nos. 97–101, 0-6-2 tank engines of class "F1," built for the Lancashire, Derbyshire and East Coast Railway (now Great Central Railway), but purchased from Kitson & Co. by the Hull and Barnsley Railway. Nos. 72 and 92 are 0-6-0 goods tender engines of class "B," these being of usual type with domeless boilers.

[Reply to "WAVERLEY."]

Slipping Coaches.

It is not essential for a reduction of speed to be made by the main train prior to slipping, except, of course, where a sharp curve through the station at which the slip is detached is the subject of a speed restriction for all trains, or where (as at Reading, Great Western Railway), the express takes a line looped off the main line, in order to leave the coach at the platform. The Lancashire and Yorkshire Railway is the only railway we know that makes a reduction of speed obligatory in the case of all trains slipping coaches.

[Reply to R. G. BOLTON.]

North British Railway Locomotives.

4-4-2 engine, No. 901, *Highland Chief*, was built a few years ago. It is generally of the same class as the others, but has superheating apparatus. On the Aberdeen route these engines often take very heavy loads, though the gradients are far

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from easy and speed orders for curves and junctions are frequent. We note your remark that you saw No. 901 banking the Sunday afternoon train from Dundee (Tay Bridge), a very heavy train worked by another "Atlantic" assisted by a 4-4-0.

[Reply to A. W. YOUNG.]

Named "Claughtons."

London and North Western Railway locomotive No. 155 became *Sir Thomas Williams* in December, 1919. It had previously been named *I. T. Williams*. Name-plates of No. 1159 were transferred to No. 161 for the time being for the Royal train on October 8. At the same time three other unnamed engines of the same class were named for the occasion. No. 150 was *Holland Hibbert ex* No. 163; No. 179 was *J. A. F. Aspinall, ex* No. 2395, add No. 205 was *Charles N. Lawrence ex* No. 2046. There was another engine named for the purpose mentioned, viz., No. 207, *Sir Charles Cust*. This name was not a transfer from another locomotive.

[Reply to "CLAUGHTONIA."]

Midland Railway 4-6-4 Tank Engines.

These were never used by the London, Tilbury and Southend Railway into Fenchurch Street terminus, as the viaduct between Gas Factory Junction and Stepney was insufficiently strong to carry such heavy engines. In comparison with the London, Brighton and South Coast Railway 4-6-4 engines, the Brighton tanks are the heavier and considerably the more powerful of the two types. The Furness Railway 4-6-4 tank engines can certainly be classed as "express" tanks.

[Reply to "TILBURY SECTION."]

Webb Three-Cylinder Compounds, London and North Western Railway.

Cranks of the two high-pressure cylinders, driving the rear pair of driving wheels, were fixed at right angles to each other; as the driving wheels were not coupled, however, and the centre low-pressure cylinder drove the front pair of wheels, there was no fixed relation between the cranks of high and low-pressure cylinders. The latter, and the lack of independent high and low-pressure cut-off, were the principal defects of these engines.

[Reply to C. E. T. J.]

Operation of Switches.

Existing Board of Trade regulations allow mechanically-operated facing points to be situated a maximum of 300 yards from the signal-box by which they are operated. Power-operated facing points, 350 yards, and trailing points, 350 yards. We understand that new regulations are now in course of preparation whereby the distance is to be increased to 350 yards for all classes of switch, and that various railways, in anticipation of this alteration, have obtained provisional sanction for the longer distance in certain special cases.

[Reply to A. E. M.]

Leeds, Midland Railway.

It has always been possible for Midland Scotch expresses to avoid Leeds by taking the direct line from the Engine Shed Junction north of Hunslet, to Holbeck, but of recent years the only Scotch train to follow this route was the summer 11.50 a.m. express from St. Pancras to Glasgow, stopping first at Shipley. Since 1915, however, all the Midland Scotch expresses, without exception, have been run into the Wellington station at Leeds, and there reversed.

[Reply to EDGAR KNIGHT.]

The Great Eastern Railway and St. Pancras.

No regular service has been recommenced by this company to and from St. Pancras, but special trains are run between St. Pancras and Newmarket during the race weeks, including a "Pullman Limited" express, while the Royal train is usually worked by the Great Eastern Railway from St. Pancras, when members of the Royal family are travelling to Sandringham or elsewhere in the Eastern Counties.

[Reply to C. S. ORPEN.]

60 m.p.h. Runs, London and North Western Railway.

It is 18 miles 74 chains from New Street, Birmingham, to Coventry, so that the 19-min. runs of the 12.45 and 6.20 p.m. expresses fall a shade short of the mile-a-minute standard—59·8 m.p.h., to be exact. But this is considerably faster than any pre-war London and North Western booking. No pre-war express by this route completed the journey in two hours inclusive of an intermediate stop.

[Reply to H. A. WHITE.]

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The Aberdeen-Penzance Through Service.

In view of the special interest attaching to this development in through working, a letter from the Rev. O. R. Walkey, of Penzance, may appropriately be quoted as follows :—

"The chief interest of the newly inaugurated through train service between Aberdeen and Penzance, to which allusion has been made in the Press generally, and the reason for such notice, lies in the fact of it being the longest regular run made hitherto by a through train in Great Britain. The distance in the 'down' or north to south direction is 792 miles 57 chains, while the 'up' journey from Penzance reduces the distance to 785 miles, by avoiding Bristol in favour of Westbury *en route* to Swindon and Oxford. The detour necessitated to follow the eastern group northward means that it is not the shortest route between Aberdeen and Penzance, which would be via Perth, Carlisle and Crewe, through the Severn Tunnel and Bristol (741½ miles) to Penzance. The nearest approach to the present through train distance was by the night express from London to Inverness, 568 miles on the West Coast route ; while during the war the naval special ran from Euston–Thurso, 721½ miles, in 21½ hours, at an average speed of 33½ miles an hour. The present run is both longer and faster than that of the naval special (which lost most of its average north of Inverness), the time for the 794½ miles down from Aberdeen to Penzance being 21 hours 55 minutes, giving an overall average of 36·3 miles an hour, including stops, while the up train effects a saving of 1½ hours over the down by covering its 785 miles in 20 hr. 40 min., or at an inclusive average of 38·1 m.p.h. The main reason for this gain in time by the northbound over the southbound train is that, both journeys commencing in the morning, the northbound spends its day on the Great Western system, where the day trains are the quicker, and follows up with the night on the northern lines, where their night services are the quicker (connection being made at York with the fast 7.10 p.m. express from King's Cross to Aberdeen), and thus getting the best of both sections. The southbound train, on the other hand, spending its day on the northern lines and its night on the Great Western (joining at Swindon the relatively slow 10 p.m. from Paddington to Penzance), gets the disadvantage both ways."

How the Services might be Expedited.

"An appreciable saving might be effected coming south," continues the letter, "by leaving Aberdeen in the evening instead of in the morning, as now. For instance, a connection at York off the 7.15 p.m. from Aberdeen could link up on the Great Western with the 5.30 a.m. from Paddington, overtaking this train at Bristol and so reach Penzance at 3.35 p.m., making the whole journey in 20 hr. 20 min., as against the present 21 hr. 55 min. As it is, by leaving Aberdeen at 7.15 p.m., one can spend nearly three hours in London, reach Penzance at 5 p.m., and thus beat by 10 min. the present southbound through timing, notwithstanding nearly three hours spent in London and 40 miles extra in distance. The southbound journey involves 34 stops *en route* with a longest non-stop run of 67 miles from Berwick to Newcastle, and its fastest, from Darlington to York, 44 miles; in 49 min., at a speed of 54 m.p.h. The northbound train stops 27 times *en route*, its longest non-stop run being 124½ miles from Newcastle to Edinburgh—all these on the North Eastern section ; while its fastest run is on the Great Western from Taunton to Westbury, 47½ miles, in 54 min., with a speed of 52¾ m.p.h.

"While advertised as a restaurant and sleeping car service, we must realise that at present there is no *through* train of such cars, only one corridor carriage—North British and Great Western in rotation—working the whole distance, together with a Great Central coach each way between York and Penzance, these coaches being attached to London trains offering the advertised facilities, the sleeping cars running north from York, or south from Swindon. So we must interpret the advertisement as being strictly true as a through *service* rather than a whole through *train* as yet.

"By way of comparison to conclude, the Indian broad-gauge run from Bombay to Madras is practically of identical length—

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794 miles—the mail trains taking some 35 hr. for this distance, at an inclusive speed therefore of nearly 23 m.p.h."

Another reader, Mr. C. Hutchison, points out that, for some purposes, other connections, though without through carriages, are more convenient, and he mentions as a rather adverse aspect, that the arrival at Edinburgh from the south at 4 a.m. is inconvenient, seeing that Edinburgh is an important destination. He suggests that a departure from Penzance about three hours later would enable the Edinburgh-Aberdeen stage to be covered by the 7.40 a.m. breakfast car train from Waverley, incidentally serving also Kirkaldy, Cupar and Leuchars Junction. By running in connection with the 4 p.m. from Plymouth, which already has connections through to York, and thence by the 10.20 p.m. ex King's Cross no additional mileage would be entailed between Plymouth and Aberdeen.

A "Train Arrivals Inspector."

MISSED branch connections, due to the late running of main line trains, have been responsible for a grievous expenditure of energy in making verbose complaints, and the writer of a letter to the *Western Morning News*, according to a cutting sent by a Plymouth reader, may be forgiven for a degree of irritation on missing an engagement from this cause. But his suggestion that "Parliament should impose a stiff financial penalty on the railway companies for every failure on their part to keep to time," with the implication that Government inspectors should be appointed to supervise train running, must be accepted as written on the spur of the moment under conditions which conduced to irritation. Many railways announce that a branch train will not wait longer than a specified time to make connections, for it has to be remembered that in many cases if it is kept back very long it cannot return in time to make connections for traffic in the opposite direction, and in country districts there is not always another train which can be drawn upon to replace it. In general the policy of the railways is to maintain punctuality for their own sakes, and they have officials whose duty it is to enquire into instances of serious late running, but delays cannot always be avoided, and although at times considerable local inconvenience is occasioned, it is due to causes down the line which are entirely excusable. On the whole it may be questioned whether, in practice, and taking one day, week or month with another, there would be much work for a Train Arrivals Inspector, and it will be an evil day for the railways, and for passengers as well, should such a step ever be taken.

World's Oldest Engine Driver.

WHO is the world's oldest engine driver? The honour is claimed by Mr. W. T. Cranfield for William Kennedy, of Winnipeg, who is 97, and in spite of the burdens of age, hale and hearty. Born at Buchanan in Stirlingshire in the reign of George IV, Mr. Kennedy began work on a Scottish railway at an early age, and when he emigrated in 1853 was already a qualified driver. He at once entered the service of the Grand Trunk Railway and for many years drove an engine on that line. Subsequently he was drawn by the lure of the west to Winnipeg, and secured employment on the Canadian Pacific Railway, then under construction. It was his responsible duty to drive the "special" that carried the paymaster. Among the notable passengers Mr. Kennedy has had entrusted to his skill, he mentions proudly, Princess Louise who, as Marchioness of Lorne, was the wife of the Canadian Governor-General. Mr. Kennedy, who has now been retired for some years, comes of an ancestry noted for longevity. His mother died at 102, and a brother residing in California has passed his 95th birthday.

Transport Development.

IN the course of his presidential address to the members of the Institute of Transport at the second annual meeting held at the Institution of Civil Engineers, Sir Henry P. Maybury, K.C.M.G., C.B., taking "Development" for his subject, said :—

"Development of railways and tramways was so brusquely interrupted by the war and has since been so hindered by high costs of materials and high rates of interest that the keenest efforts of all transport agencies will be needed to recoup the arrears. How urgent the need and how short the respite is shown by the ominous fact that in the calendar year 1920 the advance of population regained its stride and an unprecedented excess of births over deaths (491,652) was recorded. Small wonder that plans for the electrification of suburban lines are now undergoing consideration by most of the great railways converging on London."

In regard to the work of Sir Eric Geddes—the first President of the Institute—as Minister of Transport, the speaker said :—

"There stand to his credit several complex Acts of great moment, demanding in their sponsor a secure mastery of multitudinous detail and a ready gift for judicious compromise and conciliation.

"Among his achievements may be numbered :—

"1. The Railways Act, 1921, a great measure of reorganisation and regulation foreshadowing the grouping of railways, setting up a Rates Tribunal, reconstituting

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Wages Boards, modifying procedure in regard to light railways, &c.

"2. The Roads Act, 1920, which establishes a new basis for the taxation of mechanically-propelled vehicles and provides the funds enabling aid to be given to highway authorities throughout the country. It also sets up a new procedure in regard to the restriction of traffic on unsuitable roads.

"3. The Unemployment (Relief Works) Act, 1920, conferring valuable additional powers upon local authorities desiring to acquire land for arterial road schemes.

"An era of intense activity is evidently opening in the railway world, where there is a plain determination to provide the public with facilities, conveniences and attractions from which we have been weaned of recent years.

"The restoration of many valued privileges is in sight if not already achieved. The time-tables tempt us with accelerated services; restaurant cars, popular day excursions, week-end fares, later trains, extra services during rush hours, and threats are even held out of the abolition of that deeply engrained war habit of strap-hanging."

The Institute of Transport.

THE report of the Council of the Institute of Transport for the year 1920-21 states: The progress and utility of the Institute is bound up with the development, prestige and prosperity of the transport industry and the measure of public recognition accorded to both and, whilst the number of new members enrolled during the year may be regarded as satisfactory, and the influx of graduates and students especially so, there would appear to be need of further attention in some transport circles, to the material advantages to be derived from association with a professional institution. That there is little cause however for concern as to the strength of the present membership of the Institute, is evidenced by the fact that certain older institutions which have deservedly established a world-wide reputation, were no less than 10 years reaching the figures the Institute is able to announce to-day.

The period under review was generally one of anxiety and stress, from which transport was not exempted. Many connected with the industry have been consequently engrossed with urgent problems, to the exclusion of questions beyond the circle of their immediate professional duties. With a view to removing certain difficulties which arose in carrying out the Articles of Association the Council has defined more clearly the interpretation of membership qualification and has made certain transfers to higher grades.

The first graduates' and students' society has been formed, its constitution approved, and active work will be commenced early in the ensuing session. Its progress will be watched with interest, and it will it is hoped, serve as a precedent for others to be established in the more important traffic centres. A larger project for setting a higher standard and for the co-ordination of transport educational facilities has been under consideration as a direct outcome of the suggestion contained in the presidential address delivered at the commencement of the session.

Another feature, and one which marked an epoch in the history of the Institute, was the Manchester Congress. Its success and the formation of the first local section—the North Western—which resulted therefrom, were materially assisted by the splendid organisation and untiring energies of the Local Congress Committee and its hon. officers. The report adds that on September 30, 1921, the membership roll of the Institute was as follows:—Resident within the United Kingdom—members, 430; associate members, 224; graduates, 227; students, 117. Total, 998. Resident outside the United Kingdom—members, 42; associate, members, 34; graduates, 7, Total, 83. Grand total, 1,081.

The North British Railway Claim.

THE First Division of the Court of Session has recalled the judgment of the Railway and Canal Commission which had ordered the Lord Advocate, as representing the Ministry of Transport and the Treasury, to pay to the North British Railway Company £430,000, deducted by the Minister from the company's claim for December, 1920. While this decision has been acclaimed by the general press as a result to the advantage of the taxpayer, it does not, indeed, affect the main question, except that the North British Railway Company has been seriously incommoded in regard to its financial obligations. The decision, in fact, by no means disposes finally of the company's claim, on the merits of which the Court of Session makes no pronouncement. It merely decides that the Minister had a discretion to withhold the sum in question for the time being, pending the final adjustment after decontrol, and that he did not exercise this discretion illegally, unreasonably or capriciously. The Court in coming to this conclusion, makes no reflection on the integrity of the railway company or its chief officers, nor does it in any way override the decision of the Commissioners that under the agreements the liability of the Government for repairs was not limited to the quantum of 1913, after making allowance for the great difference in prices then and now. Costs, fortunately,

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do not follow the event in the decision of the Court of Session.

Attention may be called to the pronouncement of the Court that it was a pity that the inconvenience which the railway company had suffered could not have been avoided by the Transport Minister's acceptance of some such accommodation as the Lord Advocate very properly proposed to give the company. Fortunately, however, the period of Government control was now ended, and this dispute about the December account of 1920 formed an item in the process of adjustment of the "ascertained deficiency" which was now due and in which the Railway and Canal Commission had full power in the event of difference arising. One of the special conditions attaching to the North British Railway during the war was the exceptionally heavy naval traffic with which the company had to deal, and which has had a very material bearing on the question of repairs.

Further Reduced Fare Facilities.

STAGE by stage the railway companies are steadily re-introducing the various concessions and facilities of pre-war years. On the goods side rates have been reduced on iron ore, ironstone and limestone for blast furnaces and steel works; and proposals are being considered for reduction in the charges for pig iron and similar commodities, and for coal. So far, however, it is mainly the passenger traffic which has benefited. The various concessions, as they have been given, have been noted in these pages from time to time. To them must be added the application of week-end fares (Saturday to Monday) on an almost universal basis, and further reduced fare facilities recently announced as follows :—

(1) Tickets for spectators travelling to important football matches will be isused to individual passengers at a single fare and a third for the double journey by specified ordinary trains, available on day of issue only. This facility is given to meet the needs of the public where special excursion trains are not provided.

(2) Similar facilities will be granted to individual passengers attending flower and agricultural shows, bazaars, opening of places of worship, meetings of choral societies, Sunday school festivals or other similar gatherings. These tickets will be issued from stations within a radius of 60 miles of the town where the local event is taking place. Minimum adult fare, 1s.

(3) Tickets available on day of issue only, will be issued at a single fare and a third for the double journey, with a minimum charge of 6*d*., to members of Metropolitan clubs, consisting of employees of large firms when travelling to and from their ground or headquarters. These tickets will be supplied to the Secretary of the club, the concession to be subject to a minimum issue of 500 during the year.

(4) Return tickets available on day of issue only will be issued on one day per week from 12 noon to stations within a radius of 60 miles by specified ordinary trains at the rate of a single fare and a third for the double journey.

(5) Tickets at a single fare and a third for the double journey, available on day of issue only, minimum fare, 1s., will be issued by specified ordinary trains on one day per week to stations within a radius of 60 miles from towns to holiday resorts.

Historic American Locomotives on Tour.

IN the October RAILWAY MAGAZINE reference was made to the inclusion of the first locomotive of the New York Central system, the *De Witt Clinton*, with its train of ancient cars, together with the famous No. 999, in a "Pageant of Progress" in Chicago, a view being reproduced showing the 90-year old locomotive in steam alongside a modern train. Further particulars show that the *De Witt Clinton*, using wood as fuel, hauled its train for a few miles on Sunday, July 17, on the West Side line in New York City, the engine having been tuned up in preliminary trials in the New York Central shops, and attained a speed of 8 m.p.h. The engine was named after the Governor of New York State of its day, and was built at West Point, New York. Another engine for the line, the *Robert Fulton*, was built in England.

The New York Central has issued a "De Witt Clinton" edition of "The Big Four Mirror," a four-page pamphlet including several interesting views, not only of the old engine, but also of No. 999, with a portrait of Charles H. Hogan, who drove the latter on the occasion when it is claimed to have reached a speed, with the Empire State Express, of 112 m.p.h. A paragraph explains that in 1831, when the Mohawk and Hudson line was opened, the conductor, John T. Clark, wore a high silk hat and a long frock coat. Tickets were examined and collected at stops, which meant that the conductor had to climb the steps of each carriage to the outside passengers. This done, he returned to his seat at the back of the engine tender and tootled a tin horn as a signal to the driver to proceed.

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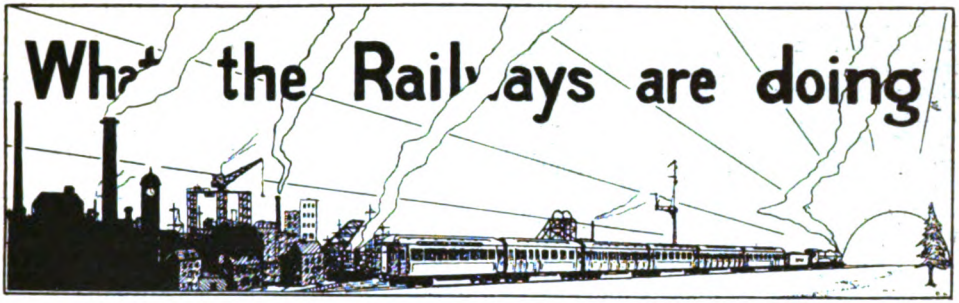

MR. ARTHUR NEAL announced in the House of Commons, on November 7, that the King had appointed Sir Francis Gore-Browne, K.C., to be president and Mr. G. C. Locket and Mr. W. A. Jepson to be permanent members of the Railway Rates Tribunal constituted by the Railway Act, 1921. Mr. Jepson, the member with the railway experience, has spent the whole of his business life with the London & North Western Railway. He has held the posts of Mineral Traffic Manager, Assistant Goods Manager, and Assistant to the General Manager. For the last two years, with the consent of the directors, he has served as the representative of transportation interests on the Rates Advisory Committee constituted under the Ministry of Transport Act.

* * *

MR. C. E. BAUGHAN, who has recently retired from the position of permanent-way inspector on the Great Western Railway at Bath, after 28 years' service in that district, had one somewhat curious experience to his credit. In November, 1894, the river Avon rose at Bath to an unprecedented height, and the low-lying parts of the city were extensively flooded. Several of the permanent way staff who lived in the flooded area were imprisoned in their own homes, and could only be released by means of ladders, which were extended from the railway viaduct to the house roofs. The men were then withdrawn by the process of removing a portion of the roof. The families who were still imprisoned were fed by lowering food in baskets from the viaduct.

* * *

RECENT railway obituary includes Mr. Charles Kennedy, Stores Superintendent, Highland Railway. The deceased was just over 70 years of age. Mr. Kennedy, who was a native of Dunkeld, joined the Highland Railway service in 1869. When a lad he did clerking duty at Dunkeld, Blair Atholl and Fochabers in turn, and in the audit office at headquarters, going to Inverness in 1873. A year later he was promoted to relieving agent, and for over two years he had temporary charge of various stations. His promotion to general inspector enabled him to acquire further experience of the "inside" working of the whole system. He held the inspectorship for about 18 months, and was promoted to Night Superintendent of Line in 1878. After doing excellent work in that somewhat trying office for 12 years, he became Assistant Superintendent of Line, receiving his final appointment, that of Stores Superintendent, in succession to Mr. Bulmer, in June, 1899. The stores were not quite in the line of Mr. Kennedy's preceding offices, but he was a man of great business capacity, and he did not lose time in obtaining a thorough grasp and control of the important department entrusted to his care. The duties of Stores

Elliott] *[& Fry.*

MR. W. A. JEPSON,

London & North Western Railway.

Appointed Permanent Member (Transportation) of Railway Rates Tribunal.

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Superintendent, which he has performed for the past 22 years, brought him into periodical contact with the officers of other railway companies, by whom his geniality and business ability were greatly appreciated. Mr. Kennedy had a kindly and obliging disposition, and was ready at all times to give his fellow workers on the Highland Railway the benefit of his friendly advice and long experience.

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MR. GEORGE THOMSON CORNET, Secretary to the Highland Railway Company, has been

MR. GEORGE THOMSON CORNET,
Secretary and Cashier,
Highland Railway Company.

appointed, as from October 1, to the position of Cashier, in succession to Mr. D. Butter, deceased, in conjunction with his previous appointment as Secretary. He commenced his railway career as a junior clerk in the secretary's office at Inverness on July 1, 1891. In January, 1911, after filling various posts in the secretarial department, Mr. Cornet, whose portrait appears on this page, was appointed Secretary of the company.

* * *

MR. W. H. CHARLESWORTH, who has recently retired from the position of Chief Claims Clerk in the Chief Goods Manager's office of the Great Central Railway, has been the recipient of a handsome china cabinet and bookcase, the gift of his many friends in the Great Central service. In making the presentation Mr. J. Rostern, C.B.E., the Chief Goods Manager, spoke of Mr. Charlesworth's long connection of 52 years with railway work, 47 of which were spent in Great Central service. He mentioned that he had known Mr. Charlesworth for 45 years, and referred in felicitous terms as to his able discharge of the duties of his responsible position. In the name of all the subscribers Mr. Rostern wished him good health and every comfort in his retirement. Mr. Charlesworth, who was much affected, expressed his appreciation of the references to his past and the hopes for his future, and of the gift, which would be valued by him and his family.

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AT a meeting of Irish Railway Managers at the Railway Clearing House, Dublin, Mr. E. A. Neale, General Manager, Great Southern and Western Railway, was unanimously elected Chairman of the Irish Managers' Conference for the year 1922. Mr. Neale started his railway career in the Irish Railway Clearing House in 1875, from which place he went to the Audit Office of the Great Southern and Western Railway about four years later. He held varying positions until 1895, when he was appointed General Manager of the Waterford and Central Ireland Railway. On the amalgamation of the Waterford and Central Ireland Railway with the Great Southern and Western Railway in 1900, he was made Assistant Traffic Manager of the latter railway, and subsequently Goods Manager. Appointed Traffic Manager in 1903, and in 1913 General Manager. Mr. Neale was Acting Chairman of the Committee appointed by Government to control Irish railways during the war.

* * *

COLONEL E. KITSON CLARK, the new President of the Institution of Locomotive Engineers, is a grandson of Mr. James Kitson, founder of the well-known locomotive building firm of Kitson & Co., of Leeds. On leaving Cambridge, Colonel Kitson Clark went through a course of training at the works of Kitson & Co., eventually becoming Assistant Works Manager, Works Manager, a director, and, from July, 1911, Managing Director of the firm. From early days he was keenly interested in the Volunteer movement, and became Commanding Officer of the 8th Batt., West Yorkshire Regiment in 1913. Owing to an accident he was declared unfit for active service during the war, but was appointed to the command of a Divisional Base Depôt in France, where he served until 1918. Colonel Clark was largely instrumental in forming a branch in Leeds

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of the Institution of Mechanical Engineers, of which he was the first Chairman, and he is now a member of the Council of the Institution. He is also a member of the Institution of Civil Engineers, and he took a leading part in the establishment of the Leeds Centre of the Institution of Locomotive Engineers, this centre being the first to organise separate meetings in conjunction with the parent Institution.

* * *

THE funeral of the late Mr. William Edward Mandelick, formerly Secretary of the Underground Electric Railway Company of London, Limited, and of other subsidiary companies of the Underground group, who died at Berlin, took place at Golders Green on October 31. A remarkable display of flowers testified to the general esteem in which the late Mr. Mandelick was held. Many members of the operating staff of the various companies were present in their uniforms, and their war medals earned on service in the fighting forces made an imposing spectacle.

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As we go to press the official announcement is made that on December 31, Sir A. Kaye Butterworth will retire from the General Managership of the North Eastern Railway and will be succeeded by Mr. R. L. Wedgwood, C.B., C.M.G., who at present holds the positions of Deputy General Manager, Chief Goods Manager, and Passenger Manager.

* * *

VISCOUNT PEEL has been appointed Minister of Transport, in succession to Sir Eric Geddes. Lord Peel, as the Hon. W. Peel, was for some time leader of the Municipal Reform Party in the London County Council. Born in 1867, he is the eldest son of one of the most distinguished Speakers the House of Commons has possessed, and he is the grandson of the illustrious statesman, Sir Robert Peel. Educated at Harrow and Balliol, he was called to the Bar of the Inner Temple in 1893, and practised for five years on the Midland Circuit.

* * *

MR. FRANK TATLOW, C.B.E., General Manager, Midland Railway, has been elected Chairman of the General Managers' Conference for the year 1922, in succession to Sir Henry W. Thornton, K.B.E., General Manager, Great Eastern Railway. For many years principal assistant to the General Manager, Midland Railway, Mr. Tatlow was appointed during the latter months of 1915 to a new position as Assistant General Manager. At the end of 1918, Mr. Tatlow became the General Manager. Having been associated with the General Manager's Department from the time he entered the Midland service as a lad, he has the distinction of having served under every General Manager the Midland Railway has had: Sir James Allport, Mr. John Noble, Mr. G. H. Turner, Mr. John Mathieson, and Sir Guy Granet.

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ON Armistice Day the whole of the staff of the Chief Goods Manager's Office, Great Central Railway, assembled at the Memorial Tablet erected to the memory of those who had fallen in the Great War, and just before 11 o'clock, Mr. J. Rostern, C.B.E., the Chief Goods Manager, placed, on behalf of himself and staff, a laurel wreath, bearing the inscription:—"In unfailing and grateful memory." Mr. A. R. Turner, on behalf of the Great Central Railway, Chief Goods Managers' Old Comrades' Association, placed a laurel wreath at the Memorial in memory of fallen colleagues. At Marylebone Goods Station, the staff of all grades assembled at the War Memorial erected in memory of the staff who made the supreme sacrifice during the War, and suitable tributes were placed at the Memorial by Mr. Parsons, District Goods Manager, and two other representatives of the staff.

* * *

ON November 11, Mr. Charles Colin Macrae, Chairman, London, Brighton & South Coast Railway, accompanied by Sir William Forbes, General Manager, Mr. J. J. Brewer, Secretary, and the Chief Officers of the Company and about 300 railwaymen, met in the General Offices at London Bridge to observe Remembrance Day.

* * *

ON Wednesday, November 9, the T.O.T. ("Underground") Philharmonic Society gave their fifth evening concert, at the Central Hall, Westminster. As usual, a very full programme was rendered, an even higher standard being reached than in the case of former concerts, notwithstanding that the Society was formed so recently as January, 1920. All three sections—band, orchestra and choir—acquitted themselves splendidly, and well deserved the ovations given to the chief sectional and concerted items, notably in Mr. Herbert Oliver's suite, "The Cries of London" (choir, orchestra and soprano soloist, Miss Ethel Dyer), the "Faust" Choral Fantasia (choir and orchestra), "The Bells of Ouseley" (band, with carillons played by Mr. W. Kingston), and the "Poet and Peasant" overture (orchestra), besides other items in which one, two or all three

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sections were concerned. High honours also attach to the solo items contributed by Miss Ethel Dyer, Miss Jennifer Gwyn, Mr. Ceredig Walters, and Mr. Noel Pherne, serious and humorous, and who all received well-deserved encores. About 300 members of the T.O.T. staff, with a few friends and relatives, occupied places on the orchestra, and the hall was filled by a large and appreciative audience, whose opinion of the performance as a whole, and sectionally, was expressed by the remarks made by Mr. H. E. Blain, C.B.E., Assistant Managing Director, who, in the course of a short speech, expressed the congratulations of all present to the choir, orchestra, band and soloists upon the high standard of excellence reached that evening. The conductors were Messrs. Ewart Beech, Lieut. J. Ord Hume, L.F., and A. Goodfellow, though much of the preparatory and incidental work had been done by Mr. C. F. Lambert (Orchestra Conductor), Mr. J. Johnson (Conductor, A. E. C. Choir and Orchestra), Mr. P. Thwaites (Accompanist), Mr. G. Murlis (Choir Accompanist), Mr. C. R. Rooney (Orchestra Accompanist), and Mr. A. E. Musgrave (Organist, who gave a short organ recital before the concert). Mr. G. Ison acted as solo accompanist, except in one case, when Mr, Herbert Oliver accompanied Miss Dyer in songs of his own composition. Mr. A. R. Wellington was responsible for platform management, while the "Underground" Press Bureau ably dealt, as usual, with press and publicity arrangements. Among those present were: T.O.T. Directors — Sir James Devonshire, and Messrs. H. E. Blain, C.B.E., Z. E. Knapp, and G. Watson; Officials—W. A. Agnew, J. Ashby, A. L. Barber, A. R. Cooper, A. Coveney, S. Gage, H. Landdown, J. B. Mackinnon, A. V. Mason, P. V. McMahon, S. Newman, A. R. Powell, A. W. Reeve, A. Rozier, H. Smith, S. Smith, A. T. Spens, J. P. Thomas, J. Thornton, and S. J. Webb. Visitors, representing other railways, included Mr. A. W. Headley, General Secretary, Great Eastern Railway Musical Society. The next concert of the Society will be given at the People's Palace, Mile End, on Tuesday, December 6, while the Operatic and Dramatic Section will render the comic opera "Tom Jones," at the King's Hall, Covent Garden, February 8 and 9, 1922.

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THE 13th annual meeting of the Great Eastern Railway Musical Society has been held. Lord Claud Hamilton, President of the Society, occupied the chair, and was supported by Colonel William Johnson Galloway, Mr. A. W. Maconochie, Mr. G. F. Thurston, Mr. J. Miller, Mr. A. E. Dolden, Mr. L. Sydney Smith, Mr. A. W. Headley (Hon. General Secretary), and others. The officers and committee were re-elected and votes of thanks were accorded the chairman, directors and officers of the company, the honorary conductor, the officers of the Society, and the chairman and members of the committee. Lord Claud Hamilton congratulated the Society on the continued progress made; he was particularly pleased that concerts had been given at military hospitals for the purpose of entertaining soldiers and others still bearing physical suffering as the result of the war, and also that the funds of such a deserving charity as the West Norfolk and Lynn Hospital had benefited considerably by the concert given at King's Lynn in January last, when their Royal Highnesses, Princess Mary, the Duke of York and Prince George were present. He regretted that it was found necessary to cancel the Queen's Hall concert in April last, the more so as the Society had attained perhaps its highest degree of merit. His lordship explained also the difficulties confronting the Society at the present time. He was pleased, however, that efforts were being made by the local choirs to carry on.

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THE first concert of the Great Eastern Musical Society for the present season, took place in the Hamilton Hall, London, on November 2, when Lady Hall, wife of Rear-Admiral Sir W. Reginald Hall, K.C.M.G., C.B., M.P., a director of the company, presided over a large audience. On taking her seat, she was presented with a silver and ivory mallet, suitably inscribed. A vote of thanks for her attendance was heartily accorded her on the proposition of Lord Ailwyn, P.C., K.C.V.O., K.B.E. (Deputy Chairman, Great Eastern Railway), who expressed the gratification of all present at seeing Lady Hall in the chair; he also spoke in kindly terms of the great interest which the hon. conductor, Col. William Johnson Galloway, a director of the railway, continued to take in the Society's welfare by which it had become second to none. Sir Frederick Green, K.B.E., another director, in seconding the motion, paid a similar tribute, and Lady Hall responded.

* * *

ON Friday, December 9, at 7.30 p.m. Mr. Cecil J. Allen will preside at a general meeting of the members of the Railway Club, 65, Belgrave Road, S.W.1, and the Rt. Hon. Lord Monkswell will address the gathering on "The Making-up of Lost Time." The annual dinner will be held at the Holborn Restaurant, on Friday, December 16. The dinner is timed for 7 p.m.; morning dress will be worn, and the tickets,

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at 10s. 6d. each, may be obtained from any member of the Committee, or the hon. secretary. At the general meeting of members, held on November 11, several alterations in the rules were passed, and for the future the Club will consist of two classes—full members and associate members. The latter class will pay a small subscription, and has been brought into being to meet the requirements of those who for certain reasons are unable to make more than occasional use of the Club premises.

* * *

FOR the current session the Institute of Transport held its first ordinary meeting at the Institution of Civil Engineers, Westminster, S.W. 1, on November 14, when a paper was presented on "The Possibilities of Improving Train Loads," by Mr. H. Kelway Bamber, M.V.O. On November 18, at the Royal Society of Arts, Adelphi, W.C., Mr. J. P. Thomas delivered a lecture entitled "The Operation and Development of Urban Electric Railway Services." The address of the Institute now is 15, Savoy Street, Victoria Embankment, W.C. 2.

* * *

ON Tuesday, November 15, a tablet to the memory of the Caledonian Railway staff who fell in the war was unveiled at Glasgow Central station with suitable ceremony.

* * *

MR. H. E. BLAIN, C.B.E., presided at the first meeting of the seventh season of Efficiency Meetings held at the London General Omnibus Company's Training School, Milman's Street, Chelsea. A paper "The Cinema in Transportation," was read by Mr. L. Findlater, Superintendent of Employment, Training and Catering, London General Omnibus Company. Mr. Findlater showed how the cinema can be employed as an aid to transportation, and also dealt with the origin and development of the cinema. By the courtesy of the Great Western Railway a film of great instructional and educative value, depicting the assembly of an express passenger locomotive, was shown.

* * *

THE Smaller Railways' Association, which took an active part in Parliament on behalf of the small railway companies in framing the recent Railways Act, have resolved to continue their existence for the purpose of exchanging notes over the progress of railway amalgamation and absorption schemes under the Act, and have arranged to hold regular monthly meetings for consultation. Many difficult questions will arise over amalgamation, and the smaller companies have realised the importance and value of combined action when dealing with the larger companies in the new railway groups. The headquarters of the Association are at 27, Abingdon Street, S.W.1, the Secretary being Mr. H. A. Sanders, of Chesterfield.

* * *

AT a meeting of the London Section of the Permanent Way Institution, Mr. H. W. Chester read a paper on "Curve Alignment," in which he showed the necessity for resetting railway curves to accurate alignment, and fully described the method of doing this by the use of theodolite and large-scale surveys. The habit of placing bridge and other structures adjacent to curves and in bad line thereto was also referred to.

* * *

A FURTHER series of London and North Western 0–8–0 superheater goods engines is now in hand at Crewe. At the time of going to press they are unnumbered. They have "Pop" safety valves, and are the first 0–8–0's to be so fitted. The three oil-fired engines, viz., Nos. 2585 *Watt* and 2663 *George the Fifth* (4–4–0's), and 2222 *Sir Gilbert Claughton* (4–6–0), are now running as formerly, the oil burners having been removed. Further four-cylinder compound passenger engines have been converted to two-cylinder simple "Renown" class, including Nos. 1907, 1931, 1947, 1973 and 1978. The following four-cylinder compound mineral engines are being simplified and superheated: Nos. 1318, 1897, 2057, 1110 (0–8–0); and 1369, 2573, 2570, 1036 and 1223 (2–8–0), the latter five being altered again to 0–8–0 type. The practice of naming the London and North Western passenger engines is to be resumed.

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LONDON and North Western locomotive which blew up at Buxton on November 11, was 0–8–0 four-cylinder compound mineral engine No. 134.

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REFERRING to recent correspondence in the RAILWAY MAGAZINE, our valued contributor, Mr. W. J. Scott, writes:—"I have at last obtained a 'Bradshaw' in which those elusive N.L. trains *via* Hounslow, are shown, viz., one for July, 1854. Needless to say, it bears out Mr. Sekon in all respects. There were then three through trains each way to and from Windsor, London & South Western. They called at all stations, except Ashford and Wraysbury; I should say from internal evidence, the engines were N.L. throughout. They stood at Windsor thus:—

			noon	p.m.	p.m.
Arr. ..	..	Down	12 0	3 15	7 20
			p.m.		
Dep. ..	..	Up	12 15	4 0	8 0

On Sundays, two trains each way. Besides

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these, there were four 'locals' to and from Kew (N.L.), from 'Hampstead Road' (*i.e.*, Chalk Farm, N.L.). These, and the others, had no stop between 'Hampstead Road' and Acton. Plainly, permission to call at Kilburn, London and North Western, had not been given. This is rather odd, as Kilburn, presumably then just outside London, was almost a principal station, London and North Western main line. Hounslow itself never seems to have been a terminus for any N.L. trains. The 'Bradshaw' of those days did not distinguish at all between the old N.L. Kew station and the London and South Western one, now Kew Bridge."

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FOR the use of ladies, the Great Eastern Railway has introduced "mid-day season" tickets at reduced rates from the London suburbs and various distant stations on the system. The tickets can be used only between the hours of 10.30 a.m. and 4 p.m., and after 8 p.m. Application for these "seasons" must be made at the station nearest to the place of residence.

* * *

DURING the recent exceptional high tide a part of the Clacton-on-Sea branch of the Great Eastern Railway, between Hythe and Wivenhoe, was washed away. This occurred about midday, and until a temporary single line could be completed, about 9 p.m. on the same day, communication had to be maintained by road conveyances. At several places in the London district lines were also affected. At Stratford low level station the platforms were at one time under water.

* * *

IN connection with the *Daily Mail* Imperial Fruit Show at the Crystal Palace, the first of the apple express trains was run on Monday, October 31, from King's Lynn, and touched all the apple-growing centres along the Great Eastern Railway line. One of the latest corridor trains was used, and the engine and tender were beflagged and painted with representations of huge apples and other fruits. Some 600 people made the journey, all of them being closely associated with the growth and distribution of apples. Mr. E. Robinson, Divisional Commercial Superintendent at Cambridge, was in charge of the train, and all along the line there were very lively scenes, crowds greeting the apple express with cheers. The train made very good time and the travellers were delighted with the journey. At Liverpool Street station the party boarded motor coaches and at once left for the Crystal Palace to enjoy what the Minister of Agriculture described as "the finest show in the world." The apple express started from King's Lynn at 6.50 a.m., and passed through such famous apple centres as Wisbech, March, St. Ives and Cambridge. The express left Liverpool Street on the return journey at 8.10 p.m., giving the visitors a very full day. Other expresses were run during the week.

* * *

ON Monday, November 7, the prices of the full table d'hote luncheons on Midland and North Western Railway restaurant cars were reduced from 4s. 6d. (first-class) and 4s. (third-class) to 3s. 6d. irrespective of class. This compares with a pre-war figure of 2s. 6d. It will be remembered that the Great Western Railway recently introduced, as an experiment, a 2s. 6d. luncheon consisting of hot or cold joint and vegetables, and either sweets or cheese, as an alternative to the standard 4s. five-course luncheon.

* * *

THE Great Eastern Railway reinstated the 4.55 p.m. restaurant car express from Liverpool Street to Yarmouth and Lowestoft on and after November 1, and it runs every week-day. From the same date restaurant cars run on the trains leaving Liverpool Street for Yarmouth at 11.38 a.m. (Mondays to Fridays inclusive) and 12.25 p.m. on Saturdays, also from Yarmouth to London at 8.20 a.m., and at 6.35 p.m. every week-day, while a through carriage between London and Aldeburgh runs on the train leaving Liverpool Street at 3.15 p.m., and in the reverse direction, leaving Aldeburgh at 8.45 a.m.

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THE new exit stairways which have been under construction at Victoria, London, Underground Station for some time, have now been opened to the public. The relief which they have afforded to this congested station has proved instantaneous, and during the rush period it is estimated that at least five seconds is saved in the despatching of trains east and west. The cost of this work was £2,250, and the improvement in the service at this busy station has fully justified the expenditure.

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WHEN the London Underground can take in hand the construction and electrification of the loop at Shepherd's Bush to connect up with the Richmond line, the City will have a choice of two Underground routes to Richmond. The Central London Tube will, therefore, provide a more or less parallel route to both Ealing and Richmond, and thus afford considerable relief to the Metropolitan District Railway during the rush hours.

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FOR some time past experiments have been carried out at Victoria Station (District Railway) with an automatic syren in connection with the starting of trains. The

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experiments having proved satisfactory in the speeding up of the services, it is proposed at an early date to introduce similar syrens at Charing Cross (District Railway), Tottenham Court Road (Hampstead Railway), and Elephant and Castle (City and South London Railway). These syrens can be set to give a sound signal at any prescribed number of seconds' interval.

* * *

AT the Bank (Central London) station the Underground are spending £750 on equipping their lifts with air gates in order to facilitate the quicker loading and unloading of the lifts at this busy station. Two of the lifts have already been fitted and the remaining three will be completed very shortly. Passengers to the Bank will appreciate this improvement, as it will allow them to enter the lift on one side and pass out by the other, thus preventing the congestion and pushing which otherwise occurs around the entrance doors.

* * *

UNDER the "Suggestions" scheme promoted by the London Underground authorities among their staff, 340 suggestions were received during the month of October. Of these, 23 were adopted, and their originators received awards. The suggestions, as usual, covered a wide field, and ranged from the fitting of an automatic catch over the guard's door in the new District Railway cars to a new design for 'bus "stop" posts.

* * *

ON behalf of the London United Tramways a beautiful lithograph of the "Master Carpenter's Court" at Hampton Court, by Mr. Jan Poortenaar, has been published by the London Underground Railways. This new picture is perhaps one of the most perfect examples of the lithographer's art as applied to posters. Its quaint picturesqueness and air of tranquility is bound to attract widespread attention.

* * *

A FINE stock of new and second-hand model locomotives, engines, yachts, etc., is held by Vernon Smith & Sons, Limited, at their Chiswick stores. The firm has sprung into prominence, particularly since the war, by promptness in dealing with repairs and low prices consistent with good work. RAILWAY MAGAZINE readers desiring to purchase or exchange model locomotive and other engines should pay a visit to the firm at 105 and 123, High Road, Chiswick. The activities of the business are not confined to model making and repairing, but are almost infinite in variety and extent. Interested readers who cannot visit Chiswick should send Vernon & Sons, Limited, particulars of their requirements.

RECENT raw weather has provided the first real test of the new accelerated services on the London Underground. It is not generally known that when inclement weather sets in there is a turnover of nearly 500,000 passengers from the motor buses to the Underground. No city in the world can show such an emergency shifting of traffic. The new eight-car trains with their 2,280 h.p. motors assist greatly in clearing the heavy stations during the rush hours. The new scheme of door arrangement in these carriages has also proved a success.

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ON Armistice Day, immediately after the two minutes' silence had been observed, a memorial to the members of the Brighton Railway Accountant's Office Staff who lost

LONDON, BRIGHTON & SOUTH COAST RAILWAY ACCOUNTANT'S OFFICE STAFF WAR MEMORIAL.

their lives in the Great War was unveiled by Mr. Chas. A de Pury, Accountant of the London, Brighton & South Coast Railway. The memorial is illustrated on this page.

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A DETERMINED attempt is to be made to attract more visitors to the Isle of Wight

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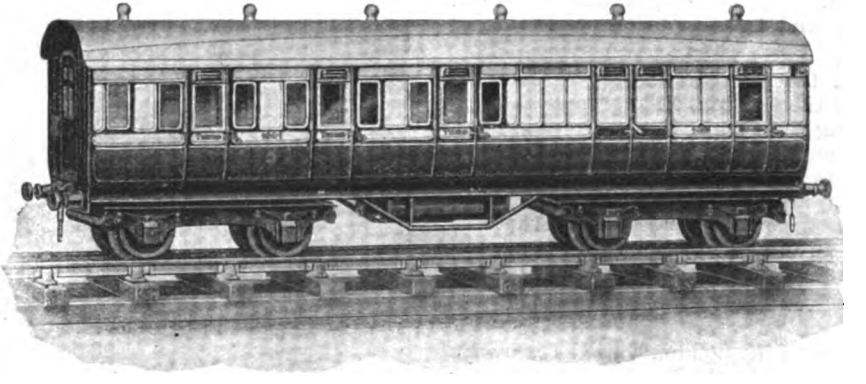
during the winter months. Strange as it may seem, the equable climate of the island in winter is apparently not even suspected by some of the leisured classes. In order to bring home the fact of the mildness of the local weather conditions a party of London newspaper men recently were conveyed under the pleasantest possible conditions, by the London, Brighton and South Coast Railway to Portsmouth, and thence to Ryde in the ss. *Duchess of Norfolk*. Thereafter a motor coach was used to carry the visitors to various points of interest. Ventnor was visited, and the summer-like aspect of that beauty spot came as an eye-opener to those of the party who had never previously visited the South Coast at this season of the year. It is understood that most of the principal hotels of the island are remaining open during the winter and are offering specially reduced terms to visitors. Both the London, Brighton and South Coast and the London and South Western Railways provide excellent services between London and the Isle of Wight by means of fast trains to Portsmouth and direct steamboat connections with Ryde.

* * *

WITH the annual advent of the muffin-bell the mind of the model railway proprietor, or would-be proprietor, turns to thoughts of Bassett-Lowke, Limited. This famous Northampton firm, year by year, as Christmas draws near, issues seductive catalogues that no railway model owner can do without. There are always novelties, and to the model locomotive or railway builder absolute necessities, illustrated and described therein, and this year's output is no exception to the rule. Quite new are the firm's fine tinplate coaches, and an illustration of one appears on this page. In the year 1910 Bassett-Lowke Limited introduced what was then thought the "last word" in scale model coaches and brake-vans of tinplate construction. Since then a considerable alteration has taken place in the general design of British rolling-stock, and the requirements of the model railway owner have become more exacting. The new models are made throughout in tinned steel plate, the doors and window mouldings are embossed to shape. Other details—gas cylinders, underframe stays, oval buffers, and in the gauge 1 size, doors to open and vestibule corridor connections—are introduced. They are splendid value for the prices asked. Another item of interest is the fact that the firm are putting on the market a model of the London and North Western Railway *Patriot*, on similar lines to the gauge 1 "Claughton" they did several years ago. Section "B" of Bassett-Lowke, Limited's illustrated list has just been published price 1s. 6*d*. It should be in the possession of every model railway owner. Most RAILWAY MAGAZINE readers are aware that the firm's London show rooms are at 112, High Holborn, W.C.1., and we have no doubt many hundreds will visit them during the coming month.



A "BASSETT-LOWKE" TINPLATE MODEL RAILWAY COACH.

* * *

GOOD progress is reported in the construction of the Chinchow-Chowyang branch of the Peking-Mukden Railway, which is under the supervision of the technical staff of the main railway. It is expected that the earthwork will be completed by the end of this year.

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TRAFFIC on the Peking-Mukden Railway is showing a steady increase, especially between Peking and Tientsin. The authorities of the line have decided to add a goods train daily service with a view to facilitating the transportation of goods between these two stations.

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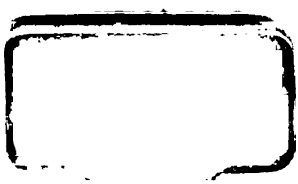

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